

COAL AGE

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No. 19

"TEACH thy tongue to say: I do not know."

Here's a proverb that can be traced back to the Talmud; from which we may infer that the "know it all" type is not a recent creation.

If you believe that there are no "know it alls" traveling with the mining fraternity, just inquire for the date of the next mine foreman's examination in your state and enter your name as a candidate but attend the sessions as a spectator. Allow us to add right here that you won't be bored to death, unless you're suffering from acute dyspepsia; and furthermore you needn't think that all of the fun will be at the expense of ignorant "cusses" who are trying to squeeze through; at any rate such hasn't been our experience.

The room where the oral part of the examination is held should be given the preference. There you'll not only be furnished with amusement but many things that have always appeared mysterious undoubtedly will be explained satisfactorily.

For example: when one of the applicants quotes a rule from a well-known book and innocently asks the examiner to explain something written therein, and the examiner in question suddenly remembers that he is needed in another room, it won't be very hard to imagine why some examiners insist that applicants for certificates leave all textbooks at home. If you read in the papers next day that Mr. So-and-So has declined to serve on the board another term because of business pressure, you can make him "dish" up the treats without half trying.

And don't think for a moment that just because you could have given the applicant a satisfactory answer that the examiner is a "dub." If you feel that way about it, before many moons you may be an examiner and some one else will get the treats.

Mr. Mining Man is there anything relating to the theory of mine ventilation that you do not know?

If you think we are joking, just reverse the question and try again; is there anything relating to the theory of mine ventilation that you *really* do know?

Considering that it is hard to decide which of these questions is ridiculous, it seems as if the average man might muster courage enough to admit, even in the presence of a beginner, that there are some things that cannot be answered off-hand.

Our examiners are not the only men connected with the industry who are ashamed at times to "fess up." Vast mining enterprises have been undertaken that were doomed to failure from the beginning, simply because some engineer ventured a random opinion rather than admit that he required time to investigate.

All of which leads us to believe that a new type of "high brows" is required in the mining industry today. Men who are able to pump information out of fellows who have had experience, and are then willing to pass the same on down the line in a manner that will provoke spontaneous discussion from both "high brows" and "low brows."

IDEAS AND SUGGESTIONS

Progressive Mine Management

BY WEST VIRGINIA ENGINEER

Coal mining is a business. Conditions must be carefully studied if the operation is to be successful. It is not only the good we do but also the good way in which we do things that brings lasting results.

Coal company officials should all cooperate in much the same way as a big family. There is a personal element in all systems; build it upward and let it be one of construction rather than one of destruction. Men must feel satisfied or they will not put forth their best efforts.

The mine official should instill interest in the work and have it done with the feeling of "all together men." Encourage, educate and train the worker. Bear in mind that selfishness and petty jealousies are often the cause of serious and unnecessary friction.

The handling of men efficiently is what increases production and lowers costs. We are all human and appreciate the good will and favor of friends. A helping hand to show an easier and better way to do some work, or a word of encouragement will surely make friends who in turn will be your well-wishers.

The men in charge must be big enough and broad minded enough to encourage those working under them; they should develop sound judgment, honesty and the spirit of fairness. Aggressiveness and competency in work should be rewarded, while the ones who shirk their duty should suffer.

An incentive for the things worth while must be sought for and encouraged. The times are progressive and successful men must be likewise. Often the experience and ideas of the most ordinary laborer will suggest worthy plans to the officials in charge.

Labor conditions are more varied than they were some years ago and naturally they must be handled differently. How often now do you find father and son working together in the same place, the former an experienced man teaching the latter to be a good miner? Good pick miners, who used to take a personal pride in their working places, are getting scarcer every year and at the present time can command almost anything within reason.

Knowledge is sufficient to correct most evils but the main trouble lies in the application. Have you ever warned a man about dangerous conditions or practices and then have him tell you that he has worked in the mines for 20 years? However, fools often serve as horrible examples.

It pays to lengthen the lives of your men and also to better their living conditions and surroundings. Discipline there must be, but make it of the sane kind. If necessary, discipline of a strict nature need not be feared. When you are in the right and working for the safety and best interests of all concerned the strictest discipline will only react for your advantage. Disrespectful familiarity must not be tolerated.

The great majority of accidents are avoidable, as they are usually the results of carelessness, recklessness or greed. Inspectors would do more good by trying to correct bad practices in the mine, rather than wait until they reach the office and write a report full of recommendations.

Playgrounds, reading clubs, Young Men's Christian Associations, churches, good schools, comfortable homes, with well fenced gardens, all encourage home life and contentment and help keep down the social unrest.

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Coöperation as Related to Scientific Management

BY A COLORADO ENGINEER

Coal mining needs a change of attitude both on the part of the management and on the part of the workmen.

About every coal mine, there is, in the minds of men, a general understanding as to what constitutes a day's work; many employees feel that a certain maximum of effort must not be exceeded. Whether a man be track laying, timbering, road cleaning, machine cutting or what not, there is present in his mind a definite concept of what he or some other man has previously done at that particular work and has received a day's pay therefor.

Now this attitude of the workman is prompted not altogether by a desire to get something for nothing; it is partly the result of the attitude of his superiors, who sometimes lie awake nights trying to find a means of increasing that maximum of labor—without correspondingly increasing the rate of pay per day.

Were our workman engaged in marketing eggs instead of labor he would not be expected to deliver more than twelve eggs for the market price of a dozen, and further, did he at some time deliver fifteen eggs for the price of twelve, his purchaser would not get fifteen the next day, for the dozen price, however much he might expect such delivery. Again, were our workman still in the egg business, and at any time, for any reason whatever, whether of his making or not, unable to deliver a full dozen, he would expect pay for only what he was able to deliver.

A MUCH-NEEDED CHANGE

The change needed is this: Workmen must be ready and willing at all times to deliver the full dozen and the management must be as willing and as ready to pay for any above the dozen delivered. The need for the change is in the necessity of establishing scientific management in coal mining.

To illustrate this need, let us suppose two mines equipped with the same type of mining machines and working the same seam of coal (this supposition is real with the unimportant exception that some of the details are not quite true). Calling these mines Nos. 1 and 2, let us suppose that at mine No. 1 a competent man is employed to look over every machine after each shift;

that the machines are in perfect running order at the beginning of every shift and that if any trouble arises during any shift, competent help is within telephone call of the machineman. Suppose we also assume that an assistant foreman sees that all working places are in proper condition for cutting; that all tracks are properly laid and kept in repair; that feed wires are always within reach of the machine cables; that bits are delivered to the machine properly sharpened and that at all times there is a complete set in a substantial box. All this and more to enable the machines to cut coal as continuously as possible.

TAKING AN ACTUAL ASSUMPTION

Let us suppose that at mine No. 2 there is no definite system about anything. Bits are sharpened by an incompetent blacksmith. These bits are taken into the mine by the machinemen themselves, in a gunny sack or in an old tomato can. The machinemen must carry their own lubricating oil into the mine and must procure this oil from a material man who has other duties than attending to supplies, and who is often remote from his place of business. The machines are run without repairs until they are completely down and out. The mine tracks are in poor condition and derailments are frequent; the haulage system is inadequate, making delays and layoffs of common occurrence; pumps are often out of order and men must work ankle deep in water. In fact the condition of mine No. 2 is such that no one is working to his capacity.

Now suppose, which is a fact, that the machinemen of No. 1 mine demand the same rate per ton as is paid at No. 2 mine, and further suppose that the management of No. 1 mine demands that machinemen work at a rate per ton which will insure the men about the same return per month as is received by the men at mine No. 2.

Both attitudes are wrong. The condition at mine No. 1 is the result of several years patient work on the part of the management with the assistance of many men who occupy no official position. The fact that machinemen can cut more coal here than at No. 2 mine is not wholly due to the machinemen themselves. It is true that doing more units of useful work, the runners at No. 1 are entitled to a larger money return than those at No. 2; but since the increased efficiency is due to many hands and to many minds, any increase in profit should be distributed among those responsible.

When there is a general willingness to let everyone who contributes to higher efficiency share in the increased profits, scientific management will be well on its road to actual realization.

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A Commendable Safety Provision

While the coal miner is slow to concede that his brethren in the metal end of the industry can teach him anything about the mining game, there are, nevertheless, important exceptions to this rule. One of these that has recently been brought to our attention is a provision the Anaconda Copper Mining Co., of Butte, Mont., has made whereby a substantial premium is offered the mine foreman having the least number of accidents during the year. In these days of keen competition, it is highly gratifying to find such a powerful and representative company as the Anaconda, with its 1800 miles of work-

ings and 10,000 underground employees, establishing such a humanitarian precedent.

The new rule of this company provides, in brief, that the mine foreman having the least number of accidents during the year shall receive a prize of \$750; there is also a second prize of \$250. No doubt the least number of accidents per foreman is computed on the basis of the average number of men they have charge of, so that the man at the large mine has an equal chance. We believe this is offering inducements at the right point.

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The Gamblers

BY BERTON BRALEY

(Written expressly for "Coal Age.")

We'll take a chance—that roof is loose and flaky,

It really ought to have another prop,

But though it seems to be uncommon shaky

I guess it isn't ready yet to drop.

We'll get another car out if we hurry,

And that means jingling silver in our pants,

The roof may fall and crush us?—We should worry!

We'll take a chance.

We'll take a chance—our holes are drilled for loading

Our tamping stick is missing—use a drill,

Although there's danger of the charge exploding

We'll take a chance, I don't believe it will;

Of course the rules forbid such methods, brother,

But nary sign of tamper meets my glance,

It's too much work to go and get another,

We'll take a chance.

We'll take a chance—there may be firedamp near us,

And if there is, it isn't any joke,

But there's no boss around to see or hear us,

So let's light up our pipes and have a smoke.

If there is damp—we'd be *some* smashed and busted

Which wouldn't be a pleasant circumstance,

But we can trust to luck—as we *have* trusted,

We'll take a chance.

We'll take a chance—we're not afraid of dangers,

There's nothing killed us *yet*, so we're all right,

To every sort of worry we are strangers,

And so you see us, always gay and bright;

Maybe some day the roof will fall and get us

The dynamite may go off in advance,

The gas explode, but we won't let it fret us,

We'll take a chance!

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Wireless Telephony in Mines

Great interest is being aroused in colliery circles in South Yorkshire, England, by a series of experiments in wireless telephony which is being carried out at the Binnington Main Colliery, and which, it is hoped, will lead to easier and safer communication with the various parts of the mine.

If the system is capable of all that the inventor claims for it, the results will be far reaching, as it is stated that a conversation can be carried on through 1500 yd. of solid rock. Great reticence is being observed concerning this matter, but when the experiments have reached a more advanced stage, it is understood that further details will be available.

Substation Loads in Lackawanna Collieries

By H. M. WARREN* AND A. S. BIESECKER†

SYNOPSIS—Defining the load factor as the ratio between the actual power entering the converter and the rating of the connected units, the authors show that the 24-hr. load factor is 12.5 and for 365 days is only 8.6 per cent. This is not for the central station but for the average of 15 substations in the anthracite region delivering direct-current only.

In view of the fact that practically no data of this nature are available and that the Lackawanna Railroad Co. has a large number of substations of which the rated connected loads widely differ, we were led to conduct a series of tests, the results of which form the basis of this paper.

Tests were made on 15 substations ranging in size from 150 to 700 kw. The apparatus in these stations consist of 60-cycle, six-phase diametrically connected synchronous converters delivering direct current at 275 volts, step-down transformers of either the single or three-phase

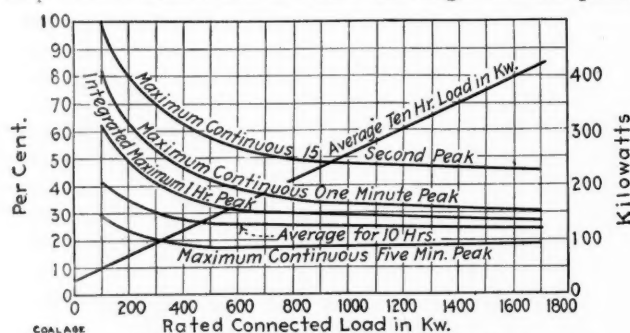


FIG. 1. SUBSTATION LOAD AND PEAKS BASED ON SYNCHRONOUS CONVERTER INPUT

type, and the necessary alternating-current and direct-current switching apparatus. These substations are usually located on the surface at the colliery, and the three-phase high-tension power is furnished from central stations.

LOADS COMPRISE MOSTLY SMALL UNITS

The power apparatus driven from the substations consists of locomotives, hoists, pumps, and under-cutting machines. The locomotives vary in size from 7 to 13 tons and are usually geared to operate at a speed of from six to eight miles (9.6 to 12.8 km.) per hour at full load. Although the locomotive weights vary, about 80 per cent. of the total number weigh seven tons or less. All of the locomotives have double motor equipments with series-parallel controllers. The motor equipments average about 10 hp. (railway rating) per ton of locomotive weight. The direct-current hoists operate on either slopes or planes and vary in size from 20 to 160 hp. As most of the large pumps are driven by alternating-current motors, the direct-current pumping sets are usually small

in size and operate intermittently. The power required for undercutting machines is at present comparatively small. It is therefore, important to note that about 75 per cent. of all direct-current power supplied from these substations is used by locomotives and that 80 per cent. of all locomotives are rated at 70 hp. or less.

HOW TESTS WERE CONDUCTED

The tests on these substations were conducted as follows: In order to obtain accurate readings, an alternating-current single-phase watt-hour meter with high-gear dials was obtained. This was connected in one phase of the alternating-current end of the synchronous converter and readings taken every half hour. A record of the peaks was obtained by connecting a graphic ammeter which was geared to give a paper speed of $7\frac{1}{2}$ in. (18.8 cm.) per minute in the direct-current side of the converter. A note was also made of the machines operating in the mine at the time of the tests.

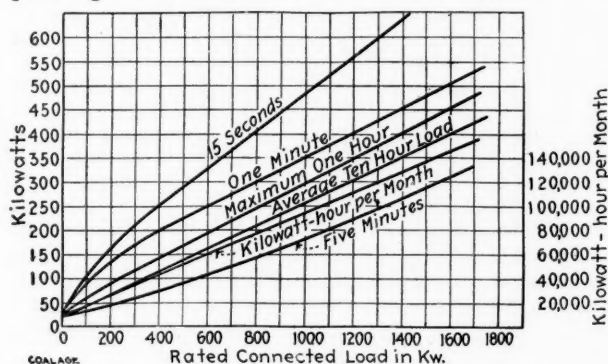


FIG. 2. SUBSTATION LOADS AND PEAKS

The rated connected loads were based on the following motor ratings:

- Electric locomotive—10 hp. per ton.
- Hoist motors (railway type)—one hour rating.
- Pumps—Name plate—continuous rating.
- Undercutting machines—one hour rating.

The total of these horsepower ratings was reduced to kilowatts in determining the kilowatt rating of the total connected load.

THE FACTORS DETERMINED

After the above test data were obtained, a tabulation was made showing the maximum peaks for 15 sec., one minute, five minutes, and one hour; the average load for a ten-hour day; the kilowatt-hours per month, and the rated connected kilowatt load for each substation.

In working up these data, the 15-sec. and also the one- and five-minute peaks were measured on the graphic ammeter paper as block peaks, while the one-hour peaks were taken from the watt-hour meter readings and are, therefore, the integrated peaks. However, after determining the direct-current peaks, an amount equivalent to the synchronous converter losses was added, so that all tabulations were made on the converter input basis.

From the tabulations, a set of curves was then plotted as shown in Fig. 2. On this chart the abscissa represents the rated connected load in kilowatts. The lower curve

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Note—A paper presented at the Pittsburgh meeting of the American Institute of Electrical Engineers, Pittsburgh, Penn., Apr. 18, 1913, entitled "Characteristics of Substation Loads at the Anthracite Collieries of the Lackawanna R.R. Co."

representing the kilowatt-hours per month is read on the right-hand margin, while other curves are read in kilowatts on the left-hand margin. From this chart other curves and factors were derived which will be discussed later.

THE DIVERSITY FACTOR

From the above, we have been able to make some interesting deductions regarding diversity factors and load factors. Diversity factor has been defined as the ratio of

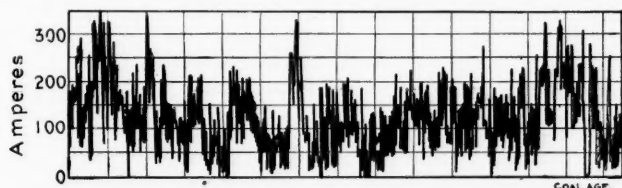


FIG. 3. DIRECT-CURRENT CHART (MULTIPLY BY 4).
RATED CONNECTED LOAD, 465 KW. VOLTAGE 275

the sum of the maxima of the subdivisions of any part of the system to the coincident maximum demand observed at the point of supply. For the present we will, therefore, consider the subdivisions as loads taken by the individual locomotive, hoist, etc., and the point of supply as the alternating-current side of the converters.

In order to illustrate how the diversity factor increases from unity to higher values as the number of units and consequently the rated connected load is increased, we have shown in Figs. 3 and 4, sections of graphic ammeter charts taken at different substations. Fig. 3 shows the load on a small substation to which the rated connected load was only 465 kw., while Fig. 4 shows a similar curve for a substation to which the rated connected load was 1720 kw. From tests made on a seven-ton locomotive, rated at 70 hp. or 52.5 kw., we find that the maximum continuous peaks in per cent. of its rating for 15 seconds,

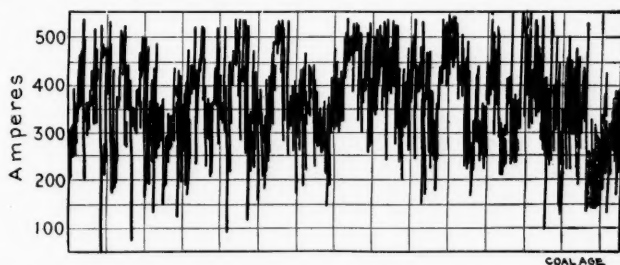


FIG. 4. DIRECT-CURRENT CHART (MULTIPLY BY 4).
RATED CONNECTED LOAD, 1720 KW. VOLTAGE 275

one minute and five minutes, are 180, 100 and 60 respectively. Based on the above as peaks for a single unit the diversity factor for 15 seconds, one minute, and five minutes for various rated loads, are as shown in Fig. 5.

THE LOAD FACTORS FOR CONNECTED LOADS

Load factor is usually defined as the ratio of the average load for a certain period to the rating of the substation. However, as the load factors on the substations are not considered in this paper, we have expressed all load factors as the ratio of the average loads on the substations to the *rated connected loads*. By so doing, any data contained in the paper become applicable to other similar installations.

Fig. 6 shows a 10-hour load curve taken on one of the

largest substations. This curve was plotted from watt-hour meter readings taken every half hour. It will be noted that it has about the same characteristics as are generally found in shops or factories where the consumption of power depends on the activity of the employees operating the machines.

However, there is a low point in this curve which occurs about nine o'clock. This is due to the fact that there is a certain amount of coal mined and loaded during the night which is ready for the locomotive crews at seven o'clock in the morning. After this night coal is pulled out, the crews ease up for a while and take a morning lunch. During this time, the day miners have been loading coal which keeps the locomotives busy until about 11:30 when the load begins to drop again. The substation on which the above curve was taken had a rated connected load of 1720 kw. which consisted of eight 10-ton, and twenty 7-ton locomotives, and a small hoist.

ANNUAL CONNECTED LOAD FACTOR ONLY 8.6

The average ten-hour load factor was 24.6 per cent. whereas the average for all substations was 24 per cent.

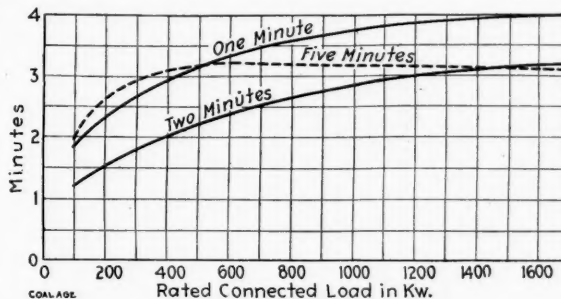


FIG. 5. DIVERSITY FACTORS

The following tabulations give the load factors for various lengths of time for this largest station and the average of fifteen stations tested:

CONNECTED-LOAD FACTORS AT SUBSTATIONS		
Station	Largest Percent.	Average Percent.
1 hour.....	32	29
8 hours.....	26	25.5
10 hours.....	24.6	24
24 hours.....	14	12.5
Annual, 365 days.....	9.6	8.6
Night, 14 hours.....	6.6	6.2

The 24-hour load factors give the average loads during a twenty-four hour working day and this might be considered as the annual load factor. However, as the average mine is not operated over 250 days during the year, the load factor on this basis for all stations tested is 8.6 per cent. It is interesting to note that the ratio of the power used during the ten-hour working day to the total used during the 24 hours was 73 per cent. on the largest station and 79 per cent. was the average for all stations. The average 14-hour night load is, therefore, 6.2 per cent. of the rated connected load.

In the application of data obtained from these tests, it will be noted that the peaks call for substation apparatus designed to carry and commutate high overloads and that the annual load factors are very low. Regardless of the question of taking care of the peaks, we find that the load increases so rapidly, due to new apparatus being installed, that it does not always pay to figure closely when deciding on the size of a substation. Some of the first stations installed for this work had 150-kw. and 200-kw. converters. These have been transferred

until now it is difficult to find a mine where the load is not too heavy for them.

CONVERTERS UNDER 200 KW. NOT ADVISABLE

We would, therefore, not recommend a converter smaller than 200 kw. and in case there is a probability of the load growing rapidly, a 300-kw. unit would be cheaper eventually. There are certain conditions where motor-generator sets work out more advantageously even though the initial cost may be much higher.

Let us assume a condition where the substation is to be located near an alternating-current motor-driven coal breaker, both of which are to be fed from a central station over a transmission line. The breaker motors will pull a load on which the power factor will be poor and this load together with the hoisting and pumping load will be so large in comparison to the substation load that the small amount of leading current obtainable from a converter, will not compensate for the lagging current taken by the induction motors.

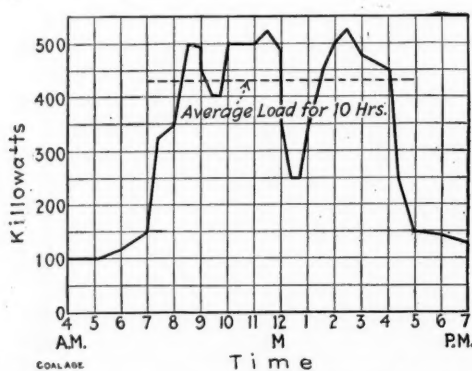


FIG. 6. A TYPICAL SUBSTATION LOAD

The above will result in poor voltage regulation on transformers and transmission line and the attending bad effects due to poor factors on a central station. If instead of using a converter we install a synchronous motor-generator set with interpoles on the generator and a motor having a ratio 30 to 40 per cent. in excess of the generator, we are in a position to correct the power factor, and better both the direct-current and alternating-current voltage regulation.

Where it is necessary to transform to a lower voltage for the synchronous motor, it will often be possible to wind the breaker motors and synchronous motor on the set for the same voltage and feed them from one bank of transformers. By combining the leading current with the lagging on the low-tension side of one bank, the kilowatt-ampere rating is very much reduced from that required for separate transformers. There is also a decrease in the cost per kilowatt-ampere due to the units being larger.

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Electric firing in series means that the arrangement of the charges is such as to permit the electric current to pass from the positive wire of the circuit to the fuse of a number of different charges in turn and from the last fuse to the negative wire. The firing of all fuses is simultaneous. Firing in parallel means that each detonator has a direct connection with the positive and negative wires, so that each fuse is supplied with a portion of the total current. The firing is simultaneous. Series firing is easier to arrange than the parallel system. It calls for more wire than parallel firing and takes a big voltage but little current, while the parallel system calls for a big current and a low voltage. For simultaneous firing the series system is the best. Low-tension fuses give better results than high-tension fuses.

Briquette Production in the United States

The output of briquettes in 1912 showed a small increase over that of 1911, and the industry may now be considered as passing out of the experimental stage and assuming a more substantial and permanent character. In 1912, at 19 plants, 220,064 short tons, valued at \$952,261, were produced as compared with 218,243 tons, valued at \$808,721, in 1911.

Of these plants seven used anthracite culm, nine used bituminous, or semi-bituminous slack, one used residue from gas manufactured from oil, one used mixed anthracite culm and bituminous slack, and one used peat.

The largest producer of briquettes was the Berwind Fuel Co., of Superior, Wis., whose output was a little in excess of 50,000 short tons. This plant has a capacity of between 35 and 40 tons of briquettes per hour.

The quantity of raw material available for the manufacture of briquettes is ample, and may be obtained at slight cost. The most desirable material for a smokeless product is anthracite culm, a large supply of which now exists and more is being produced daily in the anthracite region. It is not too much to believe or to hope that in the near future the small sizes of anthracite, such as buckwheat and smaller, that are now sold for making steam, in competition with bituminous coal, and at prices below the actual cost of production, will become more valuable as a raw material for briquette manufacture.

The output of these small sizes exceeds 20,000,000 tons annually, exclusive of 3,000,000 or 4,000,000 tons which are recovered from the culm banks by washeries. The present revenue from this product will not exceed \$30,000,000, such coal being worth from 50 cents to \$1.50 a ton, the price depending on the size.

As briquetted fuel, it should be worth as much as stove or egg coal, and the cost of briquetting ranges from \$1 to \$1.50 a ton. The uniform size of this fuel makes it highly desirable for domestic purposes. Furthermore, if properly handled, this fuel does not produce clinkers. Slack, from non-coking bituminous, sub-bituminous and semi-anthracite coals, is another cheap and abundant raw material. It is obtainable in all the coal-mining regions of the Middle West, where, at many places, it is now wasted or almost given away. Some slack piles have been burned to prevent their cumbering the ground, while others ignite spontaneously.

The vast and almost untouched areas of lignite in North Dakota and Texas contain enormous supplies of fuel that European experience has taught is well adapted to briquetting, and which is much more usable in that form than in the raw state.

The large areas of peat beds in the United States are also available as a source of raw material. They are generally remote from the coalfields and briquetted fuel from peat, when properly prepared, makes an excellent substitute for coal. The peat now produced in this country is used for stable litter, fertilizer, etc.; none is used for fuel.

While the briquet industry in the United States is still in its infancy, the production of this fuel has nearly twice doubled since 1907, the production in that year being 56,524 short tons, while in 1912, as stated above, it was 220,064 tons.

An Improved Breathing Apparatus

SYNOPSIS—A description of the principal changes in and advantages of the Model 12 Westphalia mine-rescue apparatus.

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The accompanying illustrations show the new type of Westphalia mine-rescue apparatus, Model 12, being introduced by S. F. Hayward & Co. In this model a number of important improvements have been made, which add to the efficiency, simplicity and ease of operation of the equipment.

This type is made more compact in form and fits the body much closer. There are no projecting parts, making free movement possible under the most severe conditions, thus allowing the wearer to go into low and confined places in the mine and perform whatever work may be necessary with a minimum of effort.

The supply and discharge tubes are both connected at the bottom of the breathing bag on the left side, obviating the necessity of making any connections in the apparatus after it is put on and also allowing each man to examine and test the complete circulation of his own equipment immediately before its use. The hose con-



THREE VIEWS OF THE NEW APPARATUS

necting the breathing bag to the face piece is made extremely flexible and non-collapsing, allowing the unrestrained movement of the head without any possibility of disarranging the connections.

The apparatus can be stored complete with the regenerator ready for immediate service and can be quickly put on as it is only necessary to fit the helmet on the head or properly place the mouth-piece and screw up the nose clips to be ready for instant service.

The automatic reducing valve has been made slightly shorter and more compact, and is so arranged that the injector jet can be inspected without removing the valve from its connections. The reducing valve maintains a circulation in the apparatus of about 2.1 cu.ft. per min., so that the wearer has at his disposal approximately 254 cu.ft. of richly oxygenated and pure air during the working period of two hours.

THE REGENERATOR CONSTRUCTION IS SATISFACTORY

The present construction of the regenerator is most satisfactory, as has been demonstrated during its use for several years past.

The regenerating substance is arranged in several compartments, held in wire cages placed in shelf-like form

exposing the entire surface of the material in the circulation of the exhaled air. This system absorbs carbon dioxide to an extent that has never been approached by any other similar apparatus.

In cases where the regenerator has been handled roughly or dispatched by train or motor car without proper packing, it occasionally develops that minute particles of the chemical will sift out of the regenerator. To overcome the possibility of these small grains entering the circulation tubes of the apparatus, a small trap has been fitted to the pipe at the bottom of the regenerator.

The regenerator can be quickly exchanged or refilled, either the interchangeable or refillable type being furnished, as may be desired.

The breathing bags, which are used to equalize the varying demand of the wearer during his labors, are fitted on the chest. They have been increased in size and are now large enough to provide for the demands made upon them even during the greatest exertion of the helmet man. They are protected on the outside from being cut or torn by means of a cover, which is attached with straps and swivels to the shoulder straps and back carriage and is sufficiently free to allow unimpaired expansion.

The supply and discharge tubes connect with and pass through the breathing bag in such a manner that it is possible for one to crawl on his stomach with his weight on the breathing bag, without cutting off the air supply. This is a highly desirable feature when working in small openings and one which we do not think is embodied in other types of apparatus.

It will be noticed that the pressure gage is placed in the back in a protected position, but is supplied for front reading when desired. The same apparatus can be used equally well for either mouth or helmet breathing, as it is only necessary to unscrew the couplings on the hose at the top of breathing bags and attach either device that may be most advantageous.

A feature to be noticed is that there are no valves whatsoever either in the face attachments or the entire circulating system, to become clogged with saliva or disarranged. Notwithstanding the absence of the valves, it is impossible to rebreathe any of the exhaled air until it has passed through the regenerators and been purified.

The helmet is made exceedingly light and strong and has the advantage over other types in having the face washer curved inward, so that it will fit almost any type of face; this also allows an air-tight fit to be made around the face without any uncomfortable pressure against the temples.

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When about to install a rope-haulage system, examine the roof of the gangways to be traversed, as this is often the deciding factor. When the roof is bad it is difficult, expensive and impractical to maintain a double track. When the grade is irregular and too low to allow the empty cars to run by gravity, the main and tail-rope haulage give good results. The cost of maintenance of such a system is not high, as there is only one track. This low cost is somewhat overcome by the wear on ropes and cars, due to the high speed needed to handle the output on a single road. There is always apt to be an irregular and intermittent delivery of coal at the shaft as well as a poor supply of cars at the inside parting. Notwithstanding these defects, this system gives the best results under an exceedingly bad roof.

Shrinkage of Carload Lots of Lignite Coal

By J. G. CRAWFORD*

SYNOPSIS—An investigation and compilation of some interesting data on the shrinkage of Western lignites. The tests were made in minute detail and all possible conditions effecting the results carefully considered.

In connection with the weighing of car loads of coal it is desirable to know the amount of natural shrinkage in transit. This shrinkage depends upon the character and grade (size) of the coal, the amount of surface moisture thereon and the kind and size of equipment in which it is loaded. The tests herein referred to were made for determining the probable maximum shrinkage of a certain lignite coal from dry workings, of various grades loaded in both box- and open-cars.

COAL USED

The coal used was from Monarch Vein of Sheridan County, Wyoming, and in order that no appreciable amount of the fuel might be dried slightly in the mine, that used for this test was loaded in railroad cars on the second of two consecutive working days.

The size of each grade of coal used on these tests is shown in the following table:

Size of Openings and Kind of Screen		
Grade	Over	Through
Slack.....		1-in. square rotary
Pea.....	1-in. square rotary	1-in. square rotary
Nut.....	1-in. square rotary	3-in. stationary bar
Egg.....	3-in. stationary bar	6-in. stationary bar
Lump.....	6-in. stationary bar	
Mine-run.....		5-in. shaking bar
Egg-run.....		

In order that the size of the coals will be better understood it should be stated that with these arrangements about 10% slack and 30% 5-in. bar-screened lump is obtained.

A proximate analysis of this coal is as follows:

Moisture, 23.14; Volatile matter, 36.63; Fixed carbon, 36.58; Ash, 3.65; Sulphur, 0.49; B.t.u., 10,137.

LOADING OF COAL—The coal was loaded July 29 and 30, 1909, in cars as shown:

Kind of Coal	Number of Cars		Capacity*	
	Box	Open	Box	Open
1-in. slack.....	0	2	60	100
1-in. pea.....	2	2	60	100
1x3-in. nut.....	3	2	1-50	100
3x6-in. egg.....	2	2	70	100
6-in. lump.....	3	2	60	100
Mine-run.....	0	4		100
5-in. egg-run.....	0	3		100
Total.....	10	17		

*In thousands of pounds.

The open cars were, with the exception of those in which the slack was loaded, steel cars 40 ft. long. The two cars used for slack were 40-ft. composite steel and wood but they were light weighed both before and after the series of tests and the weight of these cars was found not to have varied. The box cars were wooden.

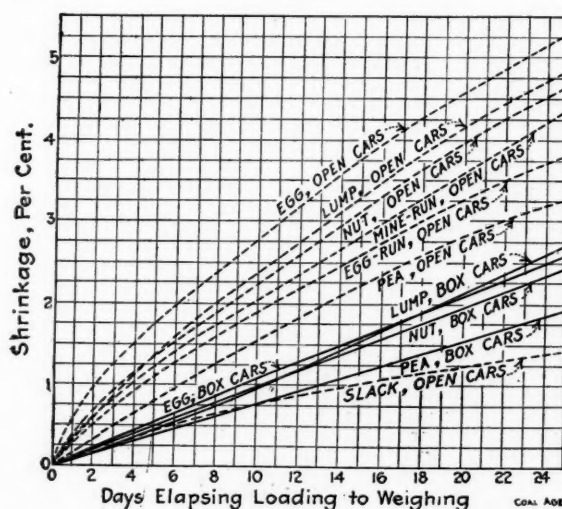
The open cars were loaded to full visible capacity and care was taken to provide against falling off in transit. The box-cars were loaded, with one exception, to above noted capacity. All box-car doors were closed. Condition of equipment was such that there was no leakage through doors or drop bottoms.

WEIGHING OF COAL—All empty cars were weighed before loading.

The loaded cars were weighed daily at Dietz, Wyoming, in the same position on the same scales about 4 p.m. Cars were watched day and night to prevent stealing.

WEATHER CONDITIONS

In referring to the days elapsing between loading and weighing, July 29 will be used as the basing point as 24 of the 27 cars were loaded on that day. An open car of slack was left standing on the Dietz scales day and night, which practically covered the bed of the scales. As soon as any rain fell, the observer on duty would visit the scales and find out how much the rain had increased the weight of the car and thus the amount of rainfall per open car was determined.



SHRINKAGE CURVES OF CARLOAD LOTS OF LIGNITE COAL

The weather conditions including the tenth day were practically ideal and during this time the total amount of rainfall did not exceed 50 lb. per open car which was divided into six light sprinkles on the fourth and ninth days. This weight had to be estimated as each shower was insufficient to "break" the scales. On the eleventh day the rainfall increased the weight of each open car 100 pounds.

From the twelfth to twenty-fourth days, inclusive, there were eight light sprinkles, four on the twelfth day and one each on the thirteenth, fifteenth, eighteenth and twenty-fourth days. The sprinkle on the latter day was the only one which affected the weight of the car on the scales, and this shower amounted to only 20 lb. per open car. The total amount of these eight showers probably did not exceed 50 lb. per open car and as they were divided throughout the thirteen days they would have no appreciable effect on the results. The tests were discontinued on the twenty-fifth day because a rain of 125 lb. per open car occurred.

During the entire 24 days, therefore, the only rain which had an influence on the results was the 100 lb. per open car which fell on the eleventh day. The only effect that this 100 lb. of rain had was to retard the shrinkage so that the actual shrinkage obtained from

*547 N. Jackson Boulevard, Chicago, Ill.

the twelfth to the twenty-fourth days was *about* two days behind what it would have been providing no rain had fallen on the eleventh day. It was possible to eliminate the affect of this rain by plotting for each kind of coal and class of car, the observed weighings as ordinates and the days between loading and weighing as abscissa. A smooth curve was then drawn through the weights of the first ten days and then another through the weights for the twelfth to twenty-fourth days inclusive. The curve through the first ten-day readings was then extended parallel to the curve through the readings from the twelfth to twenty-fourth days.

TEMPERATURE—The temperature readings were taken every hour and the average of these for the entire series of tests was 74.2 which is high for this locality as the

it does not contain as much of the badly slacked product.

The results show, as would be expected, that the shrinkage is dependent on the size of the coal and the amount of slack contained, both of these factors influencing the freedom with which the air can circulate and the size also determining the amount of exposed surface per unit volume of coal. The curves and the accompanying table probably show the maximum shrinkage which will be obtained under the temperature conditions specified and in hot, dry and clear weather. A greater shrinkage would be obtained on coal of this character from a wet mine, that used being from dry workings as noted.

The additional shrinkage which would have occurred had the cars been hauled in freight trains during the 25 days, instead of being held on track at one point,

TABLE SHOWING PERCENT. SHRINKAGE OF VARIOUS GRADES MONARCH VEIN COAL, FOR ONE TO TWENTY-FIVE DAYS ELAPSING BETWEEN LOADING AND WEIGHING, LOADED IN BOTH BOX AND OPEN CARS

Days between Loading to Weighing	Box Cars					Open Cars					
	Pea	Nut	Egg	Lump	Slack	Pea	Nut	Egg	Lump	Mine-run	Egg-run
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.08	0.10	0.11	0.09	0.09	0.16	0.40	0.59	0.29	0.22	0.30
2	0.15	0.20	0.22	0.18	0.18	0.32	0.69	0.96	0.58	0.58	0.53
3	0.23	0.30	0.33	0.26	0.26	0.48	0.93	1.24	0.85	0.80	0.73
4	0.31	0.40	0.44	0.35	0.35	0.63	1.14	1.51	1.12	1.02	0.92
5	0.39	0.50	0.55	0.45	0.42	0.79	1.34	1.76	1.37	1.23	1.10
6	0.47	0.60	0.66	0.55	0.51	0.94	1.54	1.97	1.60	1.41	1.27
7	0.54	0.70	0.77	0.65	0.58	1.10	1.73	2.18	1.80	1.57	1.44
8	0.62	0.80	0.88	0.76	0.63	1.25	1.89	2.38	1.99	1.73	1.60
9	0.69	0.90	0.99	0.87	0.71	1.40	2.08	2.58	2.17	1.89	1.75
10	0.77	1.00	1.09	0.98	0.77	1.54	2.26	2.78	2.35	2.04	1.90
11	0.85	1.10	1.19	1.09	0.83	1.68	2.44	2.97	2.53	2.19	2.40
12	0.92	1.19	1.30	1.20	0.88	1.82	2.61	3.17	2.71	2.34	2.18
13	1.00	1.28	1.40	1.32	0.93	1.96	2.79	3.36	2.90	2.50	2.31
14	1.07	1.38	1.50	1.43	0.98	2.09	2.96	3.55	3.09	2.65	2.45
15	1.14	1.47	1.60	1.55	1.03	2.22	3.13	3.74	3.28	2.81	2.59
16	1.22	1.57	1.70	1.66	1.08	2.36	3.30	3.93	3.47	2.96	2.73
17	1.30	1.66	1.80	1.77	1.12	2.48	3.47	4.10	3.65	3.12	2.86
18	1.37	1.75	1.90	1.89	1.17	2.59	3.63	4.26	3.82	3.28	3.00
19	1.45	1.85	2.00	2.00	1.21	2.70	3.79	4.41	3.98	3.43	3.12
20	1.52	1.94	2.10	2.11	1.25	2.80	3.94	4.56	4.14	3.59	3.24
21	1.60	2.04	2.20	2.23	1.28	2.89	4.10	4.71	4.29	3.74	3.36
22	1.67	2.13	2.30	2.35	1.13	2.99	4.25	4.86	4.44	3.89	3.48
23	1.75	2.22	2.40	2.46	1.35	3.08	4.39	5.00	4.58	4.05	3.59
24	1.82	2.31	2.50	2.58	1.38	3.16	4.53	5.14	4.72	4.20	3.70
25	1.90	2.41	2.60	2.70	1.41	3.25	4.68	5.28	4.85	4.35	3.81
No. of cars...	2	3	2	3	2	2	2	2	2	2	3
Capacity....	60M	2-60M 1-50M	60M	60M	100M	100M	100M	100M	100M	100M	100M

Note—Coal loaded July 29 and 30, 1909. Tests completed Aug. 23, 1909.

Table represents shrinkage with no rain.

temperature at nights is low. The more important temperature results are as follows:

Highest individual reading.....	Deg. F. 106
Lowest individual reading.....	43
Highest daily average.....	80.0
Lowest daily average.....	62.2
Average entire series.....	74.2

RESULTS OF TESTS—Under "Weather Conditions" was described the method of deriving a curve to show the net weight for each day after loading of each grade of coal in each class of equipment, had no rain fallen. The accompanying figure gives similar curves to show the per cent. shrinkage for each grade of coal loaded in each class of equipment had no rain fallen on the eleventh day. The results of these tests are also given in tabular form herewith.

CONCLUSIONS

The results show in detail the shrinkage under various conditions and it is interesting to note that in open cars for the same grades of coal, is about twice that of coal loaded in box-cars. As shrinkage is accompanied by deterioration the advisability of using box-cars, where possible, is emphasized. The shrinkage takes place mainly on or near the top of the coal in open cars, this portion soon slacking and thus protecting the rest. The deterioration in open cars, therefore, is greater near the top of the cars and not only is the coal in box-cars in uniformly better condition at the end of a given time but

would not have been great. One open car of pea coal was weighed at Sheridan and then hauled to Edgemont 223 miles east, back-hauled to Sheridan and reweighed, the two weighings at Sheridan being made within 60 hr. of each other. The difference between the two, after a haulage of 446 miles was only 100 lb. and had the car have been standing, a greater shrinkage than this would have been expected. That a greater shrinkage did not take place was probably due to the fact that the coal had been rained on slightly, although on arrival at Sheridan for reweighing the coal did not show any traces of this.

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Antartic Coal Fields

Prof. D. W. Edgeworth David is quoted in the Australian press as saying:

In reference to the scientific discoveries of Scott's party there can be no doubt they will prove of immense interest and importance. In the first place, it is stated that a good collection has been obtained of fossil plants associated with the seams of coal discovered by Shackleton at Buckley's Island, at the head of the Beardmore Glacier. Frank Wild, of Shackleton's party, was the actual discoverer of seven seams of coal outcropping in a great cliff face of sandstone and shale. Thickness of these seams was 7 ft., inclusive of a few clay bands, and Wild chopped small specimens of the coal out with his ice ax. These have been analyzed in Sydney, and show the coal to be of workable quality. It is almost certain that this coal field will prove to be perhaps one of the largest of the unworked coal fields of the world, as it has been traced about 650 miles north of the Beardmore Glacier.

Our British Coal-Mining Letter

SPECIAL CORRESPONDENCE

SYNOPSIS—Modern machinery being hard to maintain in maximum efficiency, cards of instruction should be issued to those operating it especially where untrained men are employed in charge of complex apparatus. It is shown that pneumatophores need to be aided in operation by an injector but the suction action should be corrected by an equalizer. Turbines are gaining rapidly in popularity especially as supplementary to such engines as are wasteful of steam.

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In a paper read before the Association of Mining Electrical Engineers in East Scotland, a suggestion, not without value in other directions, was made by H. J. Humphreys. He directed attention to the prevailing ignorance of those who have the oversight and working of electrical apparatus, apart, of course, from the trained electrician. The proposal of Mr. Humphreys is that the colliery manager and the electrical engineer of the colliery should collaborate in preparing a card of instructions for each class of men having to operate the electrical plant. The card should bear a number of instructions in terse simple language, printed in bold type, and each instruction should be followed by a short explanatory note, giving the reason for the instruction. Each card should also contain an admonition requiring the recipient to study the existing "Special Rules" relating to electricity, also requesting him to ask for further information on any points which he may not understand. In addition, there should be a note of warning of the serious dangers of disregarding rules.

Mr. Humphreys considers that cards of instruction would be useful for the following classes of men: (1) Authorized persons operating switches at the upper landing; (2) authorized persons operating switches below ground; (3) motor drivers; (4) coal-cutters; (5) fire-bosses; (6) "brushers" and repairers and (7) roadmen.

Other instructions may be drawn up to meet individual requirements, and, of course, it is recognized that it is impossible to draw up a set of rules applicable to all collieries. The actual form must depend on the needs of the particular place and the character of the plant.

DANGERS OF INJECTORS IN RESCUE APPARATUS

John Cadman has directed attention to a danger in the use of such mine-rescue apparatus as depends on the successful action of an injector. In a discussion by G. Blake Walker before the South Staffordshire and Warwickshire Institute of Mining Engineers, he said that when he first purchased two pneumatophores, similar in general principle, they were both far inferior to any kind of rescue-apparatus manufactured today, and the whole of the circulation of the respirable air was dependent on the efforts of the lungs of the wearer. The apparatus became foul in about half an hour, due partly to difficulty in the absorption of the CO₂ and to the intermittent supply of oxygen.

To overcome this the injector was introduced, resulting in (1) the oxygen supply being definitely regulated; (2) the flow of oxygenated air being maintained at a constant volume throughout the apparatus and so regulated

as to meet exactly the needs of the wearer. With the apparatus not fitted with an injector, it was necessary to adopt a bypass to give the man sufficient oxygen when doing strenuous work.

THE INJECTOR SUCKS AIR

With the early non-injector type, it was found that the regenerative system was inefficient; often the percentage of carbon dioxide rose to 3 and 4 per cent., while the heating of the exhaled air was excessive. These troubles were removed with the introduction of the injector. Mr. Walker referred to the special point raised in Dr. Cadman's paper; namely, the danger that, while the object for which the injector was introduced was to force air through one part of the apparatus; the reflex action given by suction in the other part of the appliance was not sufficiently considered.

Now that attention has been drawn to its liability to cause trouble, Mr. Walker says it appears to admit of a simple and obvious remedy, and by fitting an equalizing receptacle to the pneumatophore, constant pressure can be maintained, as can easily be seen by applying a water-gage. With the apparatus not fitted with this receptacle, the inhalation shows a minus pressure and the exhalation a plus pressure. With the equalizing bag, when the equalizing receptacle is inflated, the pressure in that receptacle comes to the assistance of the breather and maintains the pressure throughout the apparatus at the plus value, while again the effect of breathing restores to the equalizing receptacle the amount of air which is extracted from it.

TURBINES AT MINES

C. H. Bailey and R. H. N. Vaudrey addressing the Association of Birmingham Students of the Institute of Civil Engineers, stated that many mines are being equipped with turbines, mostly of the mixed-pressure type. A large number of mines, otherwise efficiently and economically operated exhaust large quantities of steam into the air throughout the year.

The turbine has to compete successfully against gas engines, Diesel and other heavy-oil engines and steam engines, and has to justify its introduction by superior economy and by freedom from stoppages either of short or long duration. When steam is used for hoisting engines, the turbine will almost certainly be an economical factor at a large colliery plant, as there will be in all probability much steam which will be exhausted at a pressure several pounds higher than that of the atmosphere.

The authors summarized the economy resulting from turbines as follows: Above 200 kw. the steam turbine is more efficient than the reciprocating engine. The first cost of small turbines is about the same as for reciprocating engines; but for large units the prime cost is only about half the cost of the reciprocating-engine set, including condensing plant. The steam consumption of a turbine of 2000-kw. output may be about 15 per cent. less than that of a quadruple-expansion engine, and the maintenance is considerably less. Buildings and foundations for a turbine are less costly and depreciation and repairs are also less.

Coal Preparation in Franklin Co., Illinois

By R. DAWSON HALL

SYNOPSIS—The coal of Franklin County, Illinois, is of superior quality, containing less sulphur than that mined in the northern portion of the state. The coal, passing through the shaker screens on the tippie, is re-screened at all the mines before shipment. In one mine the coal is cleaned in spirals and 4 per cent. of ash is removed.

The coal of Franklin County is the best in the state of Illinois, and there has been, therefore, little need to clean it. The retail coal dealers frequently advertise the coal as a washed fuel, but there are no washeries in the county. The coal has the general appearance of a fuel which has been improved by washing and readily sells as if so prepared.

DRY CLEANING AT A BITUMINOUS COLLIERY

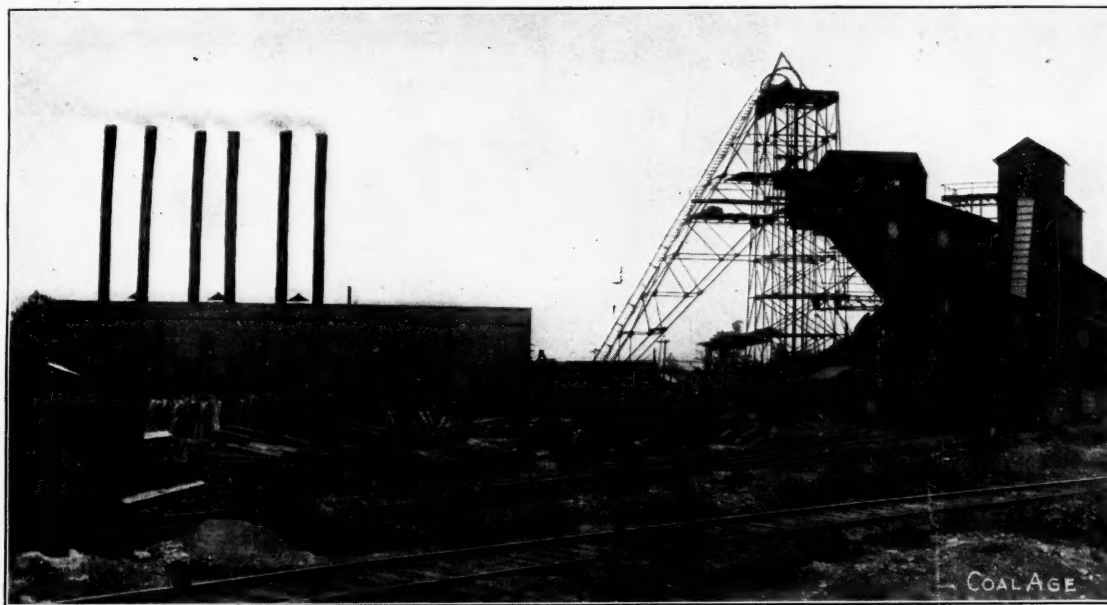
There is now one plant, the Wilmington Star Mining Co.'s mine, at West Frankfort, where dry cleaning has

Frankfort should show such improvement under mechanical preparation. It would be easy to understand it if the coal were full of slate partings. But, in the whole 9 ft. 3 in. to 12 ft. 6 in. of coal, there is but one small parting, known as the "blue band," which varies from a mere trace up to one inch in thickness.

WHERE DIRT OFTEN ENTERS CLEAN COAL

In every mine, however, a certain amount of rock falls either in first mining or in pulling back the pillars. It is usual in the Franklin County field to leave coal in the roof until returning with the ribs, when all the roof coal which can be recovered is secured. Sometimes, and in fact quite usually, the pillar is lost and all that is obtained is that part of the coal in the roof between the room pillars.

This roof rubbish and the unimportant parting in the coal, furnishes the opportunity to the Wilmington Star Mining Co. to better their ash percentage 4 per cent. They cannot fail to have an advantage over those com-



ZIEGLER DISTRICT COLLIERY CO., CHRISTOPHER, ILL. RESCREEN IN REARGROUND ON RIGHT

been introduced, and the pressure on the other companies to meet competition will doubtless result in many others being built. There is a tendency to wait and find out whether the Wilmington Star Mining Co. is satisfied with its investment before other companies follow suit.

All the evidence points, however, to the fact that the dry cleaning process is more than justified and that the Wilmington Star Mining Co. does not regret its action. Consequently it is to be anticipated that before long all the plants in the county will not only rescreen, but clean their coal.

The coal of Franklin County, on an average, contains 11 per cent. of ash. Dry cleaning reduces this percentage to 7 per cent. The waste or bone from the cleaning plant is taken to the boilers and is consumed to make power for the colliery. This waste is 26 per cent. ash.

It is surprising that a seam so clean as this at West

panies which are cleaning solely by an inspection of the coal as it enters the car. In most mines two men attend to the "placing" of the car and the loading. Both of these men at intervals watch for the few pieces of pyrite or bone as they fall from the chute or roll over in the "gondola."

PYRITE AND CALCITE

The pyrite in the Franklin County coals is of bright metallic luster. It seems to appear in small bodies rather than disseminated in partings. It does not, however, disintegrate and destroy the integrity of the coal, nor does it whiten on weathering like much of the bisulphide of iron in the coal of central Pennsylvania. Inconsiderable veins of calcite may be found, mere flakes of mineral on the dividing planes of the coal. To show that the appearances of pyrite have largely a scientific interest and little ef-



PLANT OF HART-WILLIAMS COAL CO. RESCREENER
IN REAR

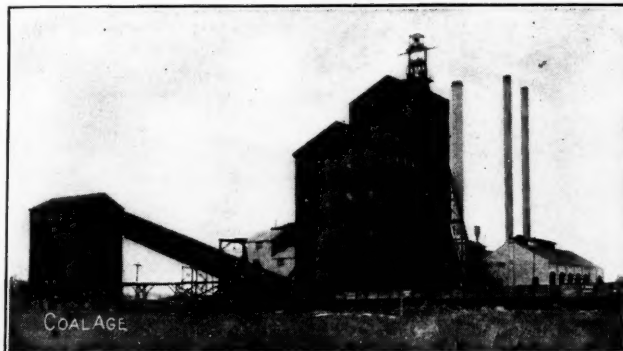
fect on the value of the col, I give the following analysis of coal from Ziegler, Ill., quoted from "The effect of Oxygen in Coal."*

ANALYSES OF ZIEGLER COAL ON AIR-DRIED BASIS

Ultimate Analysis	Screened Coal	Run of Mine	Sized Coal	Lump	Lump
Carbon.....	67.48	67.91	69.05	70.55	70.70
Oxygen.....	14.99	13.53	14.23	13.11	11.98
Hydrogen.....	4.54	5.10	4.85	4.51	4.96
Nitrogen.....	1.53	1.49	1.48	1.56	1.48
Sulphur.....	0.54	0.54	0.57	0.64	0.96
Ash.....	10.92	11.43	9.82	9.63	9.92
	100.00	100.00	100.00	100.00	100.00
Proximate Analysis					
Fixed Carbon.....	52.58	52.23	54.46	55.19	53.03
Volatile matter.....	31.23	30.33	29.33	31.31	31.63
Moisture.....	5.27	6.01	6.39	3.87	5.42
Ash.....	10.92	11.43	9.82	9.63	9.92
	100.00	100.00	100.00	100.00	100.00

It is interesting to compare the sulphur in the Frank-

*David White, Bull 29, Bureau of Mines.



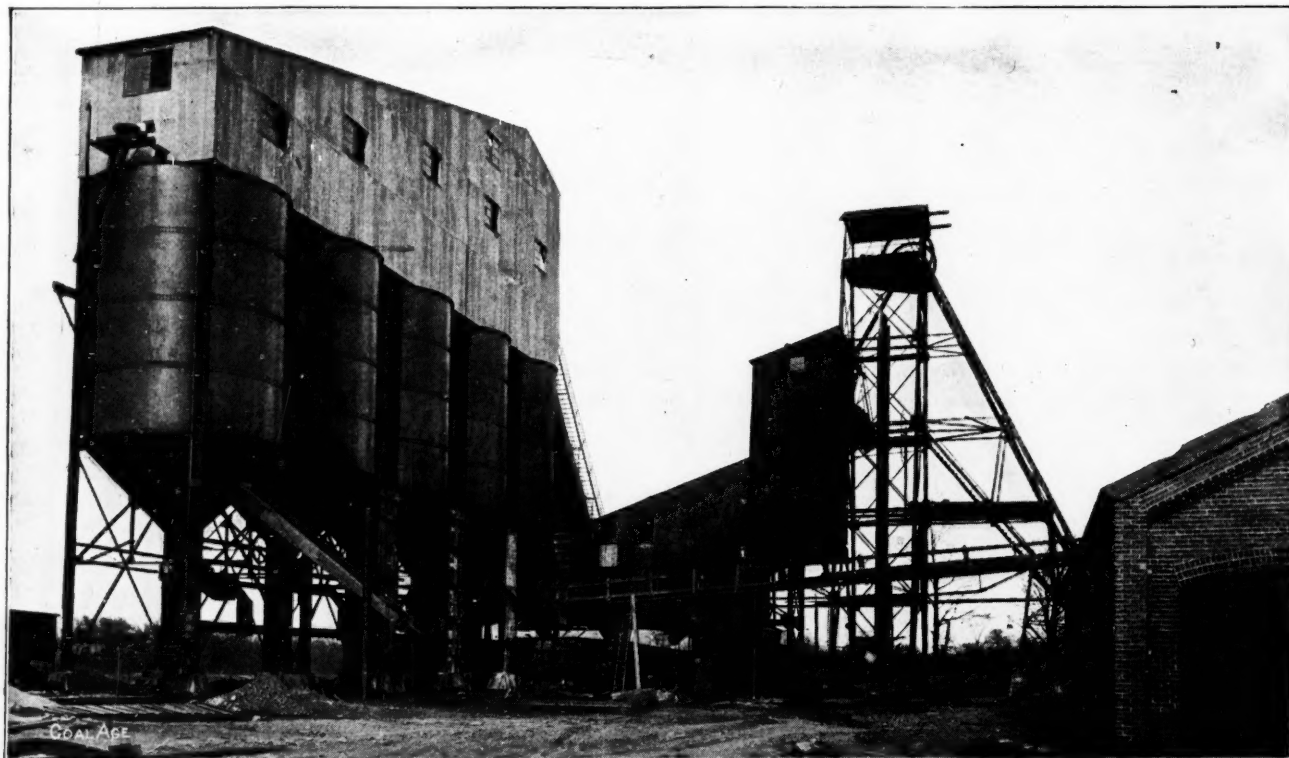
VIEW OF ZIEGLER COLLIERY, SHOWING RESCREENER
WITH CONNECTING CONVEYOR

lin County coal with that in other parts of the state using for that purpose the same report.

SULPHUR IN ILLINOIS COALS

Maryville.....	5.68	Lump	O'Fallon.....	4.25	Screened
New Baden.....	5.33	Screenings	Worden.....	4.05	Screenings
Germantown.....	5.06	Lump	Centralia.....	4.04	Coarse coal
Donkville.....	4.98	Slack	Bush.....	3.61	Run of mine
Maryville.....	4.90	Screenings	Harrisburg.....	2.96	Run of mine
Shiloh station.....	4.80		Bush.....	2.70	
Livingston.....	4.71		Bush.....	2.65	Run of mine
Collinsville.....	4.69		Bush.....	2.60	Run of mine
Paisley.....	4.68		Harrisburg.....	2.51	Screenings
Livingston.....	4.68	Run of mine	Cartersville.....	2.07	
Coffeen.....	4.67	Run of mine	Marion.....	1.77	Run of mine
Collinsville.....	4.63	Slack	Cartersville.....	1.76	
Donkville.....	4.58	Lump	Benton.....	1.62	Egg coal
Livingston.....	4.56	Screenings	West Frankfort.....	1.56	Slack
Springfield.....	4.52	Lump	Troy.....	1.55	Lump
Auburn.....	4.50	Run of mine	Cartersville.....	1.37	Mixed
Coffeen.....	4.45	Run of mine	Herrin.....	1.36	Lump
Staunton.....	4.43	Run of mine	Troy.....	1.34	Lump
Staunton.....	4.39		Herrin.....	1.19	Lump
O'Fallon.....	4.30	Slack	Troy.....	1.17	
La Salle.....	4.28	Lump			

It will be noted that all the fuels from the Centralia coal onwards have less than 4 per cent. of sulphur and all these are in the Franklin and Williamson fields except Harrisburg and Troy. Benton, West Frankfort and Zeigler are in Franklin County, and Herrin, Bush, Car-

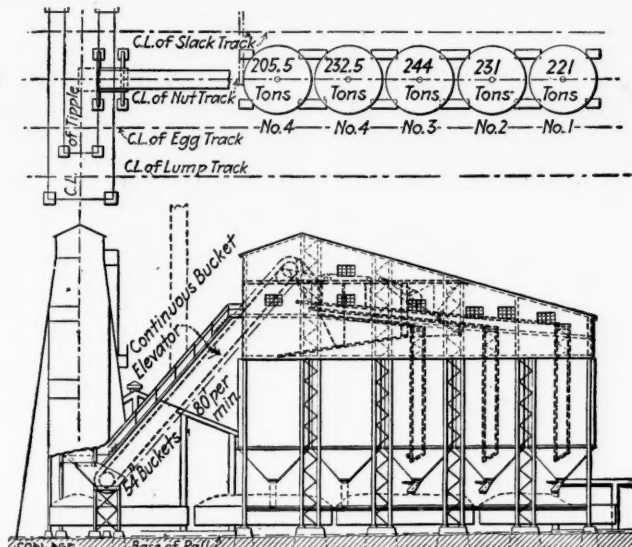


THE NEW RESCREENER AT THE MINE OF THE UNITED COAL CO., BUCKNER, ILL.

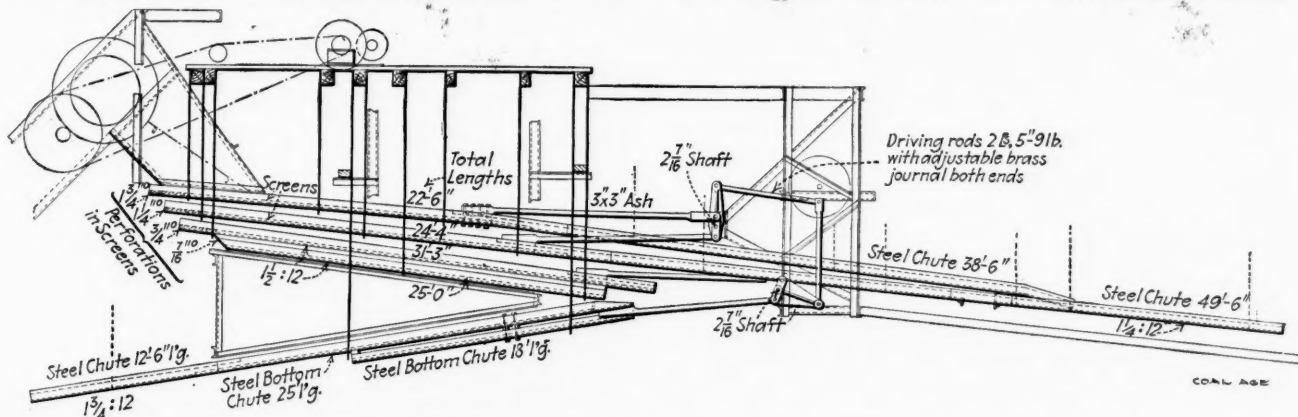
terville and Marion are all in the adjoining county of Williamson, which is regarded as part of the same field.

SPIRALIZING AND DRY CLEANING

It is significant that the cleaning of coal by the dry process has started at a point where the coal is of unusually high grade. The superintendent, Mr. Buchanan, has



SIDE VIEW AND PLAN OF THE BUCKNER RESCREENER



ELEVATION OF SHAKER SCREENS IN BUCKNER RESCREENER, SHOWING MODE OF ACTUATION

traveled in every coal-producing state in the Union, and in several foreign countries, and he is not disposed to follow the lead of others, but to introduce commendable innovations. The coal is screened at the tipple into three sizes; lump, that which passes over a screen having circular openings 6 in. in diameter; egg, that which passes through the lump screen and is held by a screen which has 3-in. openings, and smaller sizes which pass through both screens.

The coal is then carried by a large 36-in. 7-ply conveyor belt, manufactured by B. F. Goodrich, having a capacity of 2000 tons per day, to shaker screens supported from below by Parrish arms. Here it is sized into 5 sizes, known on the market as Nos. 1, 2, 3, 4 and 5. These screens are driven by a 75-hp., 220-volt, 4-pole motor, having a speed of 500 revolutions per minute.

The cleaning of the coal is provided by 28 spirals. The clean coal in passing down the spiral falls off to one side and is carried downward by the outer spiral casing. The bone coal remaining on the inner spiral is carried down to a gate at its foot, and thence to a bin, from which it is

conveyed to the boiler room. The slate passes toward the center and thus is collected separately from the impure coal.

The bins beneath this rescreening and cleaning plant will hold 1200 tons of coal and 300 tons of bone. The plant is now being arranged to store egg coal also. This is transferred to the rescreener by a separate conveyor and goes directly to a bin without any rescreening, the purpose being simply to stock the coal at times when the loading of egg coal would interfere with operation.

THE BUCKNER RESCREENER

All the mines of Franklin County have their rescreener. The degree to which the rescreening has been carried varies considerably from plant to plant. That at the Buckner mine, near Christopher, is perhaps as complete as any. Certain recent additions are not shown in the plans and elevations. The wrought-iron posts between the bins have been stiffened by a filling of concrete and a conveyor to carry the fine coal or "duff" to the boilers is being installed.

There are four water-tube boilers in two batteries, built by the Model Automatic Smokeless Model Stoker Co., of Dayton, Ohio. At present these are being stoked with screenings by hand, but when the conveyor is completed, the fuel used will be duff and the stoking will be automatic. The storage capacity of the tipple is 1134 tons. The designers and erectors of the rescreener are Allen &

Garcia, of Chicago, and the mine is owned by the United Coal Mining Co.

ROLLER SCREENS IN PREPARATION PLANTS

It should be noted that both the screeners described, screen the coal through shaker screens, but this is not the general practice. They are generally used on the tipple, but roller screens are usually installed in the rescreener. In the Ziegler District Colliery, the coal larger than 2 in. in diameter is conveyed to the rescreener. It passes in this building into a roller screen 20 ft. long, with 1 1/4-in. circular openings. So only two sizes of coal are made in this rescreening plant; coal between 1 1/4 in. and 2 in., and coal under 1 1/4 in.

Coal of a uniform size can be burned with less smoke and waste than a fuel of mixed sizes. The commercial demand for careful rescreening is not unreasonable, as the consumer gets a real benefit and is willing to pay an increased price. It is likely that in a few years, the operators of many districts will introduce improved methods of sizing coal.

Geology of the Panther Creek Valley, Penn.

By W. B. RICHARDS*

SYNOPSIS—An interesting description of the geology in one of the important anthracite fields. A detailed study of all the measures in the coal horizon is given, with special reference to those which are coal-bearing. The customary complexities, common to the anthracite district as a whole, are well shown.

✱

The Panther Creek Valley is, roughly, 12 miles long, averaging two miles wide, and contains 8000 acres or 12½ sq.mi., about one thirty-eighth of the entire anthracite coal lands in Pennsylvania. It is located at the extreme eastern end of the Southern Anthracite Coal Field, between Mauch Chunk on the Lehigh River, in Carbon County, and Tamaqua on the Little Schuylkill River, in

First—The Subcarboniferous, consisting of the Pocono sandstone and Mauch Chunk Red Shale.

Second—The Pottsville conglomerate and the coal measures.

Third—The Permian.

The coal measures, designated by the State Geologist as Formation No. XIII, are the thirteenth distinct formation in Pennsylvania. In 1837, Henry D. and William B. Rodgers, State Geologists of Pennsylvania and Virginia, adopted a plan of numbering the formations beginning at the bottom.

As shown on the accompanying columnar section, historical geology has been divided into four time periods:

1. *Cenezoic Time*—The age of man and mammals;



STRIPPING OPERATION ON THE MAMMOTH VEIN AT THE GREENWOOD COLLIERY

Schuylkill County. It narrows to a sharp point at the spoon end of the basin, a mile east of Mauch Chunk, or at the top of the Mt. Pisgah Plane, the elevation of which is 1375 ft. or 843 ft. above the Lehigh River.

The conglomerate rocks which form the rim of the valley in the Sharp Mountain on the south, and the Locust Mountain on the north, belong to the Carboniferous, which era is subdivided, geologically, in three periods as follows:

the glacial period was in the first half of this time.

2. *Mesozoic Time*—Age of reptiles, amphibia, birds, land plants and insects of high type.

3. *Paleozoic Time*—Age of invertebrates, which is divided into the following eras:

Cambrian—No form higher than invertebrates.

Silurian—Invertebrates predominate.

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4. *Azoic Time*—No fossils known. This is the Archæan era. Mostly metamorphic or changed rocks. Perhaps, in part, original crust of the earth.

*Engineer, L. C. & N. Co., Lansford, Penn.
Note—Abstract of paper read before the Panther Valley Mining Institute.

The Archean rocks, which are named from the Greek for beginning, underly all the formations in which appear traces of vegetable or animal life. Therefore, they constitute the base of all countries, wherever life rocks occupy the surface; this is the copper- and iron-bearing strata of Lake Superior.

PALEOZOIC TIME

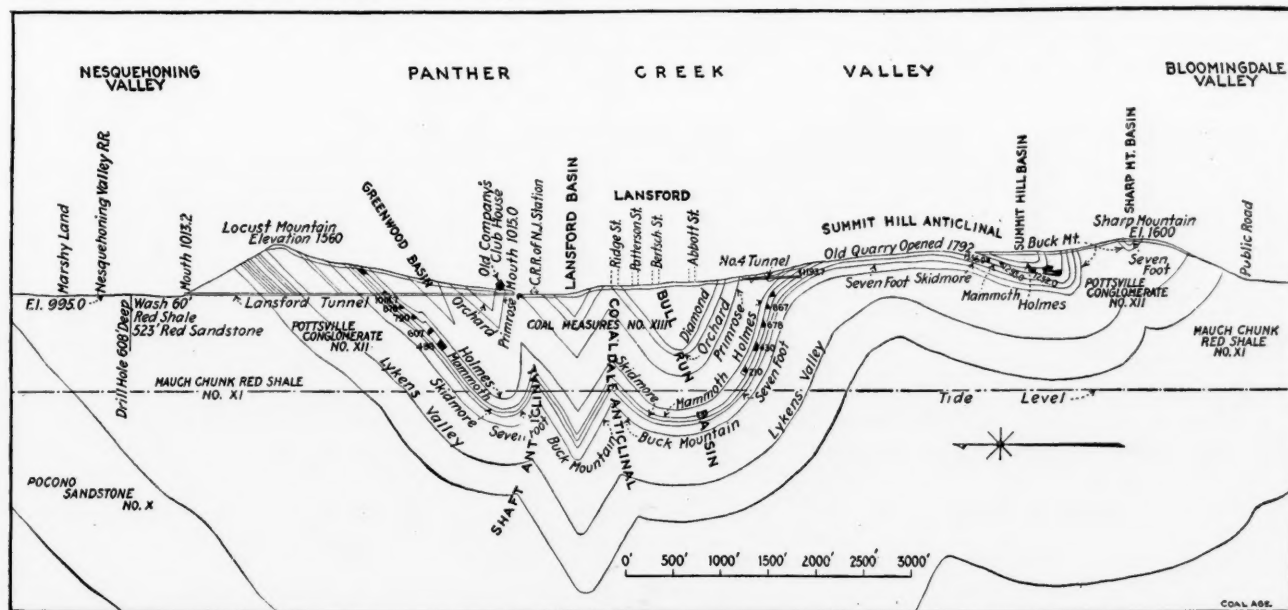
Paleozoic rocks (named from the Greek for ancient life) are the prevailing kind exposed to view over the eastern half of the North American Continent; they extend from the northern boundary of New York, southward to the coal regions of Pennsylvania. A brief *résumé* of the 13 formations of the Paleozoic Time will now be given.

Formation No. 1—Chiques sandstone (not ordinary sandstone but a quartzite) is the oldest of our fossiliferous rocks. The finest exposure is a great rock mass which towers above the east bank of the Susquehanna for

The Medina White sandstone is not only characterized by its purer color, but by its massiveness. It constitutes the real backbone of the mountains, cropping out along their crests. There is not a known valuable mineral of any kind in either of these formations.

Formation No. 5—This is the Clinton, Niagara and Salina rocks, which are noted for their red color, particularly prominent in the Bloomsburg red shale.

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CROSS-SECTION OF THE PANTHER CREEK VALLEY ON THE LINE OF THE LANSFORD TUNNEL

a mile above Columbia, in Lancaster County, where Chiquesalunga Creek enters the river. At the White Spot on the mountain behind Reading, it has been famous since the early settlement of that great valley.

Formation No. 2—The Great Valley limestone; this is noted for the superior fertility of limestone land, and derives its name, not only for its unusual width, but for its extraordinary length, being quite persistent over a course of 1000 miles from Canada to Alabama. It occurs in Pennsylvania over a distance of 150 miles, in some places 20 miles wide, and is bounded by mountain ranges 1000 ft. high. In it we have cement rock in Lehigh County; limestone quarries in Berks and Lebanon Counties; magnetic ore mines at Cornwall, Lebanon County; and zinc mines in Lehigh County.

Formation No. 3—This is the Utica and Hudson River Slate, exposed in Northampton and Lehigh Counties, in which are found the roofing slates of Slatington.

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The Niagara formation of New York cannot be recognized in this district as a distinct formation. The lower portion is shale and the upper limestone, which latter is largely of coral origin, indicating clear seas during the time of its formation. This limestone comprises the upper 85 ft. and the shale the lower 80 ft. of the Niagara Falls; the recession of the falls is slowly going on due to the undermining of the limestone by the erosion of the shale.

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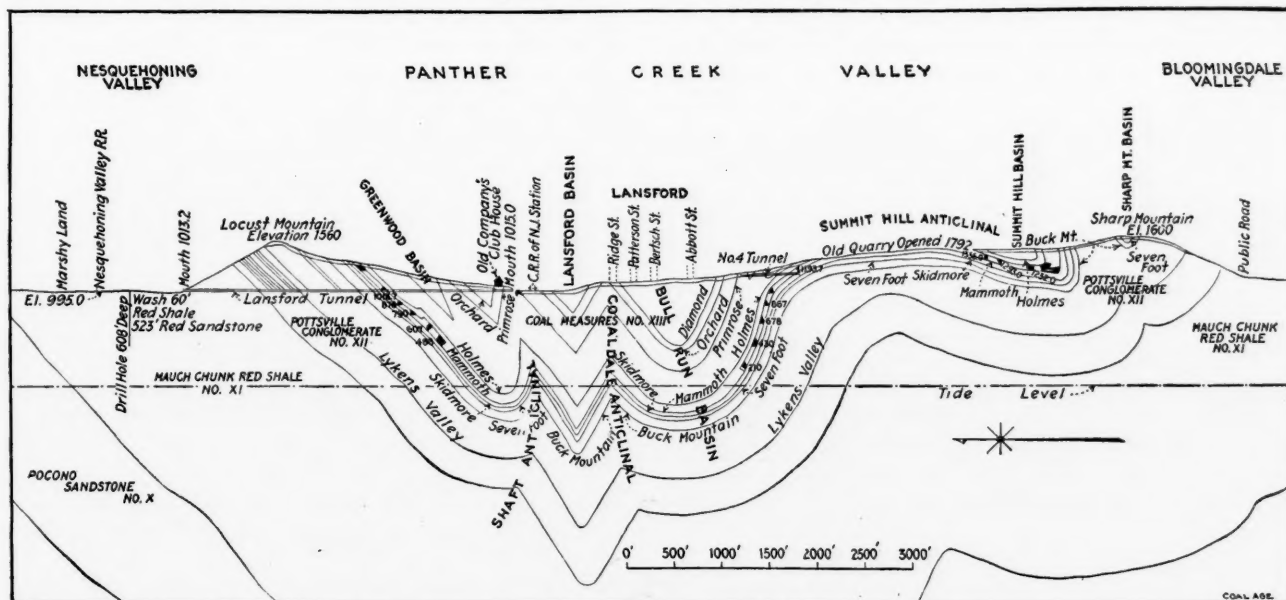
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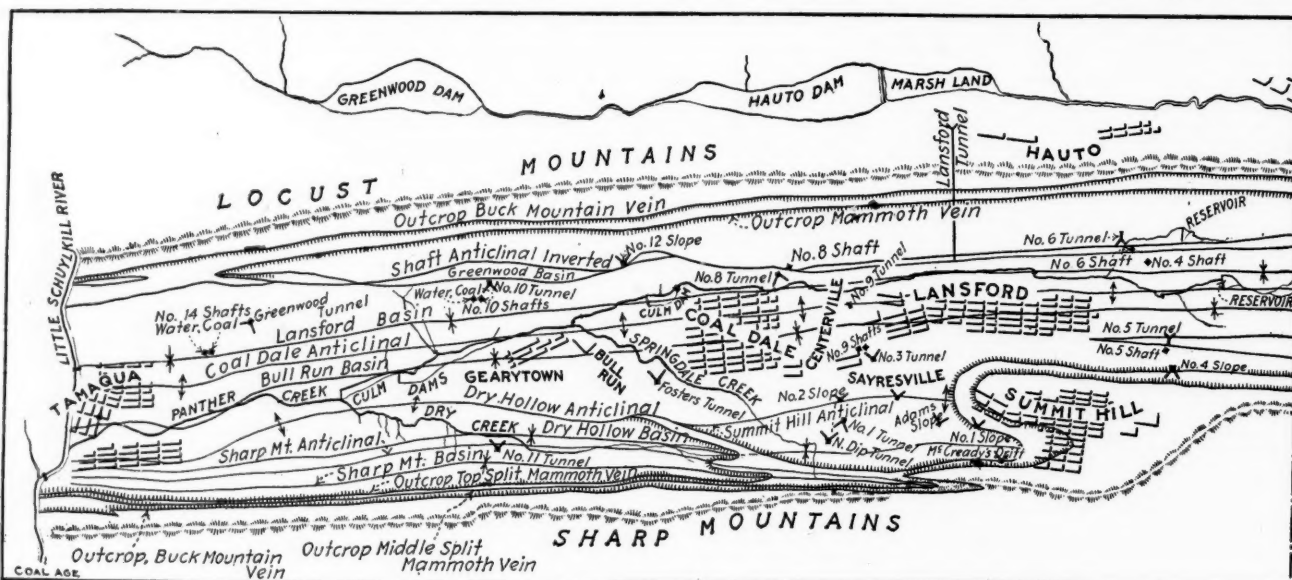
is made up of grains of sharp quartz fragments, so loosely cemented as to readily disintegrate, under the action of air, into heaps of glass sand. Glass factories have hitherto relied upon this material for the principal part of their stock in New York State.

In Pennsylvania, the outcrop of the Oriskany extends in straight, curved and zigzag lines, through nineteen counties, varying in character from sandy shale to massive flint; in some places it is crowded with shells and at others almost entirely free from them; it is also sometimes highly ferruginous, even containing iron enough to furnish furnace ore. Its outcrop in the Steinberg Ridge, 17 miles through Carbon County and 15 miles further in Schuylkill County.

The Candagalli grit is the upper part of the Oriskany sandstone and it is almost a nonfossiliferous rock. It is

Formation No. 8-G—The Chemung outcrops in Erie County. It is composed of olive and green shales, sandstones and conglomerate. It also outcrops at Stroudsburg and runs from the Lehigh to the Schuylkill and Susquehanna Rivers. Oil and gas are found in this formation.

Formation No. 9—The Catskill formation is the uppermost of the Devonian. It was named after the lofty mass of mountain sandstone on the Hudson River, near Poughkeepsie, N. Y. Coal seams of from one-half to one inch are sometimes found in this formation which consists of sandstones, often passing into conglomerates, with some shale. The beds are usually red, but greenish and other shades occur. The Catskill formation is carried forward under the Broad Mountain from a point two miles below Mauch Chunk to the Little Schuylkill River.



GEOLOGICAL MAP OF THE PANTHER CREEK VALLEY, SHOWING THE OUTCROPS

usually a sandy shale, dark or nearly black, weathering from grayish to brownish gray.

Formation No. 8-A (Upper Helderberg)—This is composed of Onondaga and corniferous limestone. The Onondaga limestone (named after Onondaga County, New York) is a deposit of fine, groundup corals and crinoids. The corniferous limestone, so called from the flint or hornstone, is often imbedded in it. The paint mines of Lehigh County are in this formation.

Formation No. 8-B—The Marcellus Black Slate outcrops on the Lehigh River a mile below Bowmans, Penn., and through Carbon and Schuylkill Counties to an anticlinal point several miles west of Schuylkill Haven.

Formation No. 8-C—The Hamilton sandstone and shale is named after the town of Hamilton, N. Y.

Formation No. 8-D—The Tully limestone is named from the village of Tully, Onondaga County, N. Y.

Formation No. 8-E—The Genesee slate (named after the Genesee River) outcrops in Carbon County one-half mile north of Kregesville and at Leighton, Carbon County, just above the Leighton Railroad station.

Formation No. 8-F—The Portage formation, named after three high falls on the Genesee River, in Western New York, is composed of shales and flaggy sandstones.

Formation No. 8-F. G.—The Girard shale of Erie County is ashen gray in color.

The second mountain south of Lansford carries forward the Catskill outcrop in a straight course, S. 62° W., to the Schuylkill River, three miles below Pottsville.

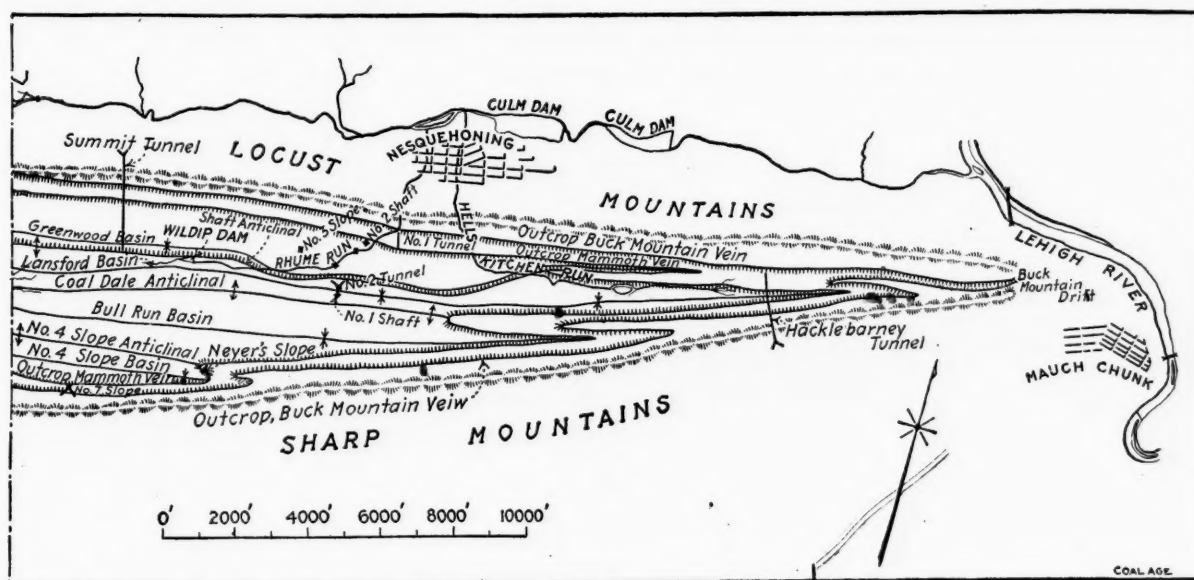
Formation No. 10—The Pocono formation (named after the Pocono Mountains in Monroe County) is the first or oldest subdivision of that great carboniferous system which has furnished most of the mineral coal in our day. The coal beds of the Pocono formation are thin and local, some of them mere collections of leaves and twigs floated into small lakes or ponds. A few were genuine peat bogs of limited extent, and soon buried under the inflowing sand. Even the earlier beds of the productive coal measures were irregular in size and area, by which it can be easily inferred that the great vegetation of the coal age had not yet spread itself.

Pocono coal has been found within the limits of Pennsylvania, in the Cove and Buffalo Mountains, on the Susquehanna, in Sidelong Hill, in Huntingdon County, on Tipton Run in Blair County, and in many other ravines descending the escarpment of the Allegheny Mountains; but at every attempt to work it profitably it has been a failure, except at the Tipton mines, a few miles north-east of Altoona. Here actual mining operations have been carried on. A branch road has been laid from the Pennsylvania R.R. at Tipton, and thousands of tons of good coal have been sent to the market.

The Pocono sandstones, which rest on the Catskill formation, form the sharp crests or flat tops of most of the mountain ranges in Carbon County. The Nesquehoning, or Broad Mountain, west of the Lehigh River, is a triangular flat compound arch of Pocono, covered with a sea sand much like that spread over the Broad Mountain of the Pottsville conglomerate north of Pottsville. North of Glen Onoko it is composed of hard gray and greenish-gray sandstone and hard gray sandstone with dark gray shale. It is 1235 ft. thick north and south of Lansford, Pennsylvania.

Formation No. 11—The Mauch Chunk red shale, 2168 ft. thick at Mauch Chunk, is certainly one of the most remarkable formations in Pennsylvania, or indeed in any part of the world. Its color, its immense thickness to the southeast and its gradual thinning out to the north-

sandstone 1200 ft. thick, making a distinct break in the lithology of that locality between the underlying Mauch Chunk red shale and the overlying coal beds, sandstones, shales, etc., of the anthracite basin. The Pottsville conglomerate is 800 ft. thick through the Lansford Tunnel. By its resistance to erosion, it has been an important factor in preserving the small part of the original anthracite field which now remains. Geologists generally estimate that for every ton of coal remaining in the hard-coal region, 98 tons have been swept away by erosion, into the Atlantic Ocean. This conglomerate is the floor on which the coal measures rest and its outcrops form a protecting and inclosing mountainous rim to the softer coal measures. It is composed of beds of gray conglomerate, white-gray and brownish sandstone, usually coarse and hard, some thin beds of carbonaceous slate and gen-



OF THE PRINCIPAL SEAMS AND THE MAIN ANTICLINALS AND BASINS

west and west and the paucity of animal or vegetable life, are among its characteristics.

Beginning at Mauch Chunk the red shale valley, walled in between the straight Pocono Second Mountain and the Pottsville Sharp Mountain, runs with a depth of about 800 ft. and a width of about three-quarters of a mile, perfectly smooth and straight, from the Lehigh to the Little Schuylkill River. The red shale turns the eastern end of the basin of the Panther Creek Valley at the sharp-pointed cliff, known as Mt. Pisgah and runs west between the Locust and the Nesquehoning Mountains to the Little Schuylkill River.

The Pocono sandstone held its own against the denuding agencies but the overlying Mauch Creek red shale is a fragile rock and was nearly eroded off the Pocono floor, thus forming the Nesquehoning, Bloomingdale and Owl Creek Valleys.

Formation No. 12—The Pottsville conglomerate is the twelfth distinct formation of the Paleozoic time and forms the basal member of the true carboniferous series everywhere in Pennsylvania. Mining men frequently refer to it as the "farewell rock" because usually no true workable coal beds are found within it. The Pottsville conglomerate is so called from its magnificent and characteristic developments near the Schuylkill county seat where it exhibits a massive structure of conglomerate and

erally one or more thin seams of coal, while in the southern part of the state, as at Lykens, Penn., it contains large and valuable coal seams.

The beds of the lower part of the formation generally have a greenish color which shades into the red of the Mauch Chunk red shale. The central part shows an increased coarseness and hardness of the materials composing it and usually forms the mountain crest or ridge. This is the part that forms the ridge on the Sharp Mountain on the south, and the Locust Mountain on the north of this valley. The upper portion, as a rule, contains more sandstone with fewer and finer conglomerates.

Limits of the Pottsville Conglomerate—The bottom of the Buck Mountain bed, the first bed overlying the conglomerate, has been taken as the upper limit. It is, as a rule, a well defined horizon and there is rarely any difficulty in fixing its position. The placing of the bottom is much more difficult, as the transition from the red shales of No. 11 to the conglomerates of No. 12 is not often abrupt.

Thickness of the Pottsville Conglomerate—The formation shows a marked decrease in thickness and in the coarseness of the materials composing it, from the southwest to the northeast, the maximum being apparently reached in the southwestern part of this field. Measure-

ments at the Lincoln and Kalmia Collieries, where there are extensive tunnels to tap the Lykens Valley coal beds, furnish a complete section of about 1475 ft. Its thickness in the Broad Mountain is about 1200 ft., which is about the average throughout this field. In the Northern field it averages about 225 feet.

THE COAL MEASURES (FORMATION No. 13)

The coal measures consist of beds of sandstone, shale, fireclay, black carbonaceous slate or shale, and beds of coal from a few inches in thickness up to the great Mammoth which, over large areas, is from 50 to 60 ft. thick. The prevailing color of the sandstone and shale is brown or gray. Beds of fine conglomerate occur within the coal measures and in some instances they are so coarse and massive as to have been mistaken for the Pottsville conglomerate. The coal seams are fairly well distributed throughout the whole of the measures, the formations separating them varying from a few feet to a couple of hundred, but it is seldom that a barren interval of more than 200 ft. occurs. The distance between the same coal beds vary somewhat, and at times decidedly, in the different basins as well as in different parts of the same basin. The lower 300 to 500 ft. of the measures, from the No. 12 to the top of the Mammoth seam, as a rule, contains the thickest coal and are more productive than those higher in the series.

Thickness of the Coal Measures—The greatest thickness is found in the deep basin of the Southern field where the total aggregates more than 2500 ft. Workable coal beds extend to the very top of the column and perhaps still others may have been originally deposited, of which every trace has been removed by erosion.

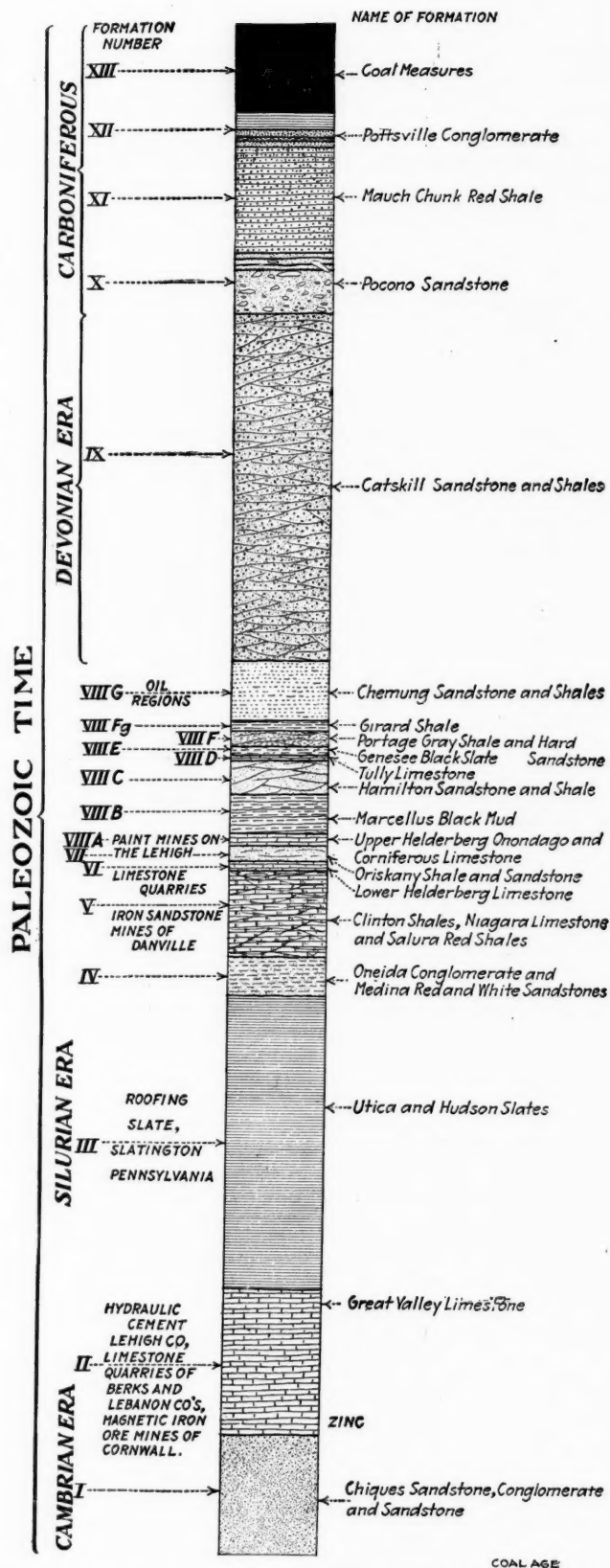
The successive deposits, from the Archean rocks to the top of the coal measures aggregate 31,500 ft., and were originally deposited in succession as shown on the accompanying columnar section, in a great water basin which, in early times, occupied the area which is now the Appalachian Mountains. Some of these measures were found in deep sea water, some in water so shallow that they exhibit mud cracks, ripple marks and foot prints and hold both shore living shells and coral reefs. These facts force us to believe that the bottom of the Pennsylvania sea continued sinking through all the ages during which these deposits were made. The rate of their deposition has been estimated at 5 ft. in a century, approximately 630,000 years to deposit the 13 formations described.

The thoughts that must be kept in mind in Pennsylvania Geology during the Paleozoic time are:

First—That which was the continental area of crystalline rocks became, by a downward movement of the earth's crust, an Appalachian sea basin of unknown depth and was in the course of the Cambrian, Silurian, Devonian and Carboniferous ages, so completely filled up as to become at last a great marsh or archipelago of marshes bearing the coal vegetation.

Secondly—That this whole area was then lifted high in the air and that a corresponding contemporaneous movement established the Atlantic Ocean, or parts of it, as the thrust that elevated the Sharp, Locust and Appalachian Mountains came from that direction.

In the accompanying illustrations there is a vertical section on line with, and through the Lansford Tunnel, showing the relative positions of the coal measures, the



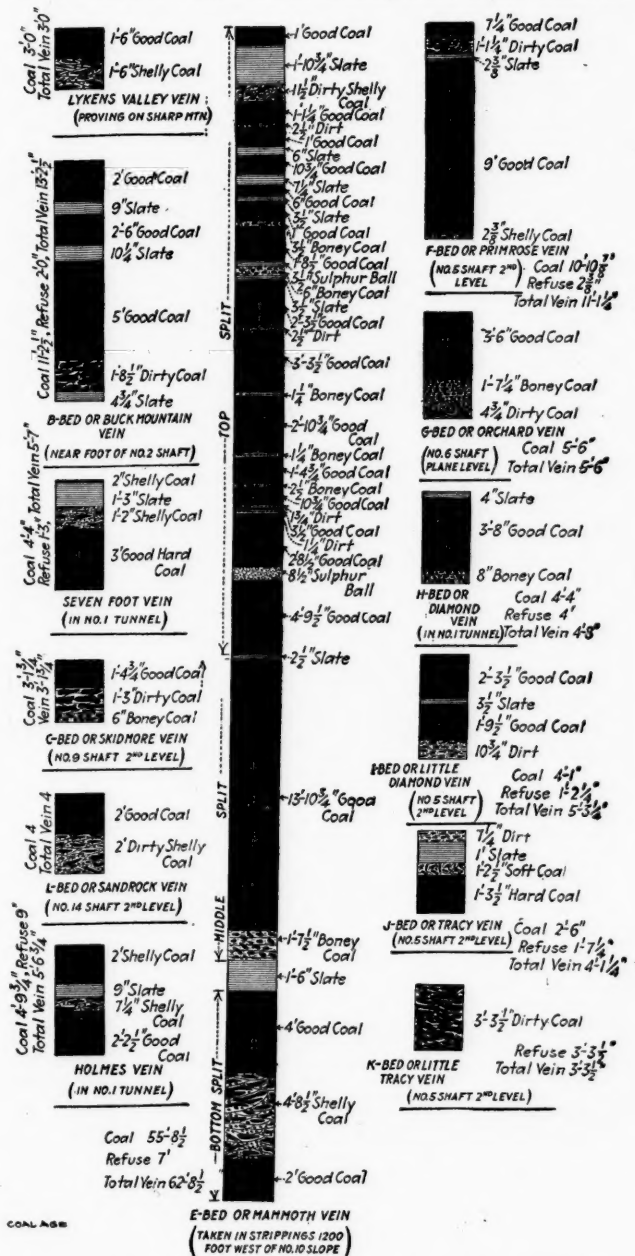
COLUMNAR SECTION OF THE PENNSYLVANIA FORMATIONS

Pottsville conglomerate, the Mauch Chunk red shale, and the Pocono sandstone, of the Carboniferous.

Flexures are generally parallel to the axis of the mountain range, but they are not so in this valley where they have a tendency to approach the southern rim of the valley, from the north to the south, and have the steepest

side generally facing the northwest, away from the Atlantic Ocean.

Measuring the Buck Mountain vein on this section, along its dips from outcrop to outcrop, you will find it to measure 10,400 ft., while, if we measure horizontally on the surface between the outcrops, we will find it to measure 7900 ft. This means that the vein, when horizontal, spread over the surface 2500 ft. more, or has been shortened 2500 ft. in consequence of its flexures.



SECTIONS OF THE COAL SEAMS IN THE PANTHER CREEK VALLEY

The coal measures (9 seams) as shown on the section in the Bull Run Basin are 1600 ft. thick. The lowest vein, the Lykens Valley, is in the Pottsville conglomerate and, in the Lansford Tunnel, it is only a streak.

The Buck Mountain, or "B" Vein, has a specific gravity of 1.62 and is only 1.6 ft. thick in the Lansford Tunnel.

The Seven Foot Vein is 12 ft. 4 in. thick and averages 11 ft. 3 in. of coal.

The Skidmore, or "C" Vein, has a specific gravity of 1.64, is 3 ft. thick of good coal.

The Mammoth, or "E" Vein, has a specific gravity of 1.61, is 40 ft. thick and averages 30 ft. 8 in. of coal.

The Primrose, or "F" Vein, has a specific gravity of 1.60, is 19 ft. thick, nearly all good coal. It will be noted on the section that the Primrose Vein is shown at the mouth of the tunnel which cuts in two places. This is due to an overthrust of the strata.

The Orchard, or "D" Vein, has a specific gravity of 1.59, is 3 ft. 3 in. thick and contains 2 ft. 9 in. of coal.

The Diamond, or "H" Vein, has a specific gravity of 1.59, and was not cut in the tunnel, but is nevertheless in the Lansford and Bull Run Basins. It is about three feet thick, with 2 ft. 9 in. of good coal.

The Buck Mountain, or "B" Vein, is not workable at this point, but at Nesquehoning and Rahn Collieries, it is a very good seam, averaging 12 ft. thick with 10 ft. of coal.

The Holmes Vein, shown on the section, has a specific gravity of 1.58. It is only about one foot thick at this point, but is being worked at the Nesquehoning Colliery where it averages five feet thick, with four feet of coal.

The analysis of coal in this valley is as follows:

	Per Cent.
Moisture	3
Volatile	4
Fixed carbon	88
Ash	5

The total distance from the Lykens Valley to the Buck Mountain seam measured at right angles to the measures is about 515 ft., subdivided as follows:

From	To	Feet
Buck Mountain	Seven Foot Vein.....	90
Seven Foot	Skidmore Vein	40
Skidmore	Mammoth Vein	40
Mammoth	Holmes Vein	100
Holmes	Primrose Vein	325
Primrose	Orchard Vein	160
Orchard	Diamond Vein	75

The total thickness of the coal measures is 1600 ft. The gross thickness of the coal aggregates 71.5 ft., thus averaging 22 ft. of rock for every foot of coal. The Pottsville conglomerate is 800 ft. thick, the Mauch Chunk red shale is 2168 ft., and the Pocono sandstone is 1256 ft. thick, showing a total deposit of the Carboniferous of 5824 feet.

The Lansford Tunnel was opened originally as a mine tunnel, but in 1870 the tunnel was driven through to Hauto and the Nesquehoning Valley Railroad ran through to the Panther Creek Basin.

On the section at Summit Hill Anticline, I call your attention to the old quarry, which was opened in 1792. The first discovery of coal in this region was made during 1791 by the famous Phillip Gintner.

There has been sent to market and used for fuel, from the Panther Creek Valley, from 1820 to 1911 inclusive, 80,000,000 tons. The estimated life from provings so far made would indicate that the coal goes to a greater depth than has yet been reached, so that there should be a good production from this valley one hundred years hence.

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The lignite beds of Alabama, Mississippi and Tennessee have been developed but slightly or not at all, while the lignites of Texas, Arkansas, the Dakotas and eastern Montana have a limited development. Lignites from Montana sometimes contain from 20 to 40 per cent. of moisture, which causes them to deteriorate rapidly on exposure to the air, thus rendering them of little value as fuel.

Phenomenal Outburst of Water at Equality.

BY LUCIEN W. GORDON*

SYNOPSIS—The mine of the Gallatin Coal and Coke Co. was submerged and in the wreck accompanying the flow of water into the mine, the tippie and surface works were all wrecked and drawn toward a crater at the mouth of the shaft. Suddenly the mine ejected water, cars and tippie wreckage; there were several such expulsions before the phenomenon ceased.

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On Sunday, Apr. 6, 1913, the 600-ton shipping mine of the Gallatin Coal & Coke Co., at Equality, Illinois, was totally destroyed in rather a unique manner, namely, by rapidly filling with back water from the Ohio River flood and by resultant outbursts of the air compressed by the inflow of water into the mine.

The entrance to the mine is an 80-ft. shaft which was sunk in 1882 by the late Broughton Temple. It was the first shipping mine developed in the southeastern Illinois field. It is located about five miles from the now well known Saline County district. The coal is extracted from seam No. 5, the number being reckoned according to the well recognized Illinois usage. Its thickness is five feet.

About 150 acres have been mined out. The main entries run to the dip and most of the rooms are driven to the rise. The roof is unusually strong and it has never broken except in about two places where the coal has been worked to the crop. The roof consists of a hard black slate with about 4 ft. of hard schist and 30 ft. of heavy bedded sandstone.

THE EFFORTS TO PROTECT THE MINE

The mine was opened at a level above any previous high-water mark, but the exceptional flood of 1884 caused a small "cave" at the crop. Pumping was necessary while

to work at raising the mouth of the shaft with sandbags and clay.

About Mar. 31, it was found that the shaft cribbing had given way just above the rock and much water and debris were falling down the shaft. This was checked by placing further sandbags and clay to resist the action. Conditions seemed to improve till Apr. 5, when the caving again commenced, the backwater steadily rising.



THE SECOND OUTBURST FROM THE GALLATIN COAL & COKE CO.'S MINE



THE MINE OF GALLATIN COAL & COKE CO. BEFORE THE FLOOD



ALL THAT REMAINS OF WHAT WAS THE EQUALITY MINE

this flood continued and after this the mine mouth and buildings were raised above the flood level of that year and a large mound was built around the plant.

About the last of March in this present year, it was seen that all previous records for high-water would be broken. All mining operations were stopped, the mules brought to the surface and all available men were put

*Equality, Ill.

On the morning of Apr. 6, the tippie was found to be undermined and extensive caving commenced at the power house about 50 ft. away. For this reason, people were ordered away from the buildings. At 10 a.m., the tippie sank out of sight, without, however, toppling over. With the buildings sank mine cars, barrels of oil, the shaker and fan engines, concrete piers and tons of rubbish. The rush broke down the greater part of the

power house, the blacksmith shop and one of the elevated storage bins.

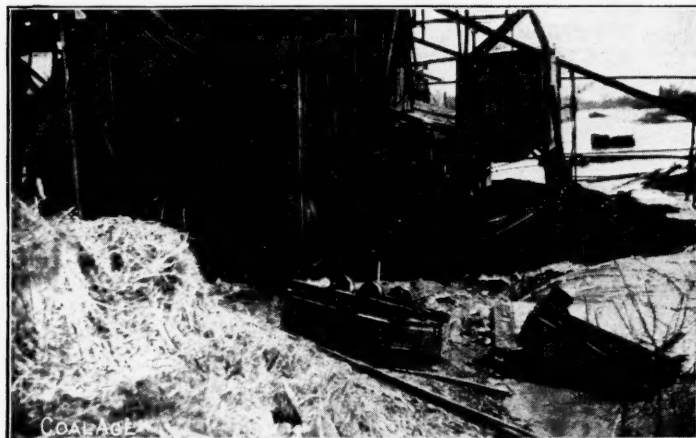
THE OUTBURSTS OF WATER

At 3:25 p.m. the mine had apparently nearly filled with water and the surface of the flood was almost quiet. The demolished plant was surrounded by sightseers, who observed the ravages of the flood from boats, the gob-pile, and high ground around. Suddenly a tremendous "explosion" occurred sending the water, dirt, rock, broken timbers and machinery about 600 ft. in the air. Twelve minutes later a second "explosion" occurred and of this I made the appended snapshot picture. Comparing the water column with known objects, I estimate

more than an acre and the 4-ft. sheaves at the top of the framework were sunk to their hubs on falling, an evidence of the height to which they were thrown.

The mine was sunk at the southern crop of the coal field and this caused the workings to be directed wholly to the north. In a measure, this probably explains the "explosions." The main entry ran N 22° W for 1200 ft. with a dip of 2 ft., then it turned to the right and went N 24° E 4600 ft. having a dip of 38 ft. in the first 1200 ft., the other 3400 ft. being flat. The east entries were driven S 66° E for 1200 ft. with a dip of 8 ft. The west entries ran N 66° W for 1600 ft. and rose 30 ft.

While some think that the compression of the air in the high levels caused the "explosions" it is more prob-



THE SHAFT BUILDINGS SINK AS THE WATER
POURS INTO THE MINE



AFTER THE TIPPLE HAD SUNK OUT OF SIGHT
BY UNDERMINING

its height as 260 ft. A number of gradually diminishing "explosions" took place till about 5 o'clock.

The weight of the water ejected, crushed in the roofs of the neighboring buildings; one of the cages known to have sunk in the mine was blown 300 ft. away, over the gob-pile, and the fan engine located at the foot of the tippie and known to have sunk with it, with its attached concrete base, estimated to weigh five tons, is now lying 60 ft. away. The 12-in. builtup posts of the tippie were broken into pieces and hurled hundreds of feet, and mine cars were seen at a height of 60 ft. above the shaft mouth. Draw slate, rock and fire clay were scattered over

able that previous caving had partially closed the foot of the shaft and that the rush of water completed the closure, thereby compressing the air in the main entries until the air pressure became greater than that of water. Many believe that the first water entered the shaft through rat burrows.

A group of men standing on the gob-pile at the time of the outburst was deluged with water and some were slightly bruised, but fortunately there was no loss of life. The mine mouth is now caved in, leaving an opening about 40 ft. across. The loss, including the expense of pumping is about \$30,000.

Meeting of Institute of Mining Engineers

BY R. DAWSON HALL

SYNOPSIS—On a per-diem basis, the coal miner is declared to have a greater death rate from accidents than the metal miner, though there is much reason to doubt the parallelism of the data on which the calculation is based. Precautions taken in aqueduct tunnels under New York City and a sizer for coal and other materials which does not depend on screenings and promises to show remarkable sizing powers and a minimum of breakage and attrition, formed the subjects of two other interesting papers.

A regular meeting of the New York Section of the American Institute of Mining Engineers was held on

Friday, May 2, at the Engineering Societies' Building, 29 W. 39th St., New York City.

The chair was occupied by G. F. Kunz, retiring Chairman of the Executive Committee of the New York Section. The following officers were elected for the ensuing year: Chairman, L. D. Huntoon; Vice-Chairman, A. S. Dwight; Secretary, T. T. Read; Treasurer, E. M. Shipp.

After a short discussion on ways and means, M. Belowsky, custodian of the Mineralogical and Petrographical Institute and Museum, at Berlin, made a speech in German, requesting the aid of the members in his work.

Albert H. Fay read his paper on "Metal-Mine Accidents in the United States." Mr. Fay, of course, in introducing his original remarks had to cover much of the

ground of his technical paper No. 40. In the latter part of the paper he did much to modify and correct the position which had been taken that today metal mines are more dangerous than coal mines.

He pointed out that the latter mines worked only 220 days, according to the report of the Geological Survey, whereas the mineral mines worked 300 days, according to his count.

The following table is compiled to show what the death rate would probably be per thousand men employed if the number of men killed were proportioned to the days worked and the time was in each case equated to 300 days per year.

LOSS OF LIFE PER THOUSAND EMPLOYEES BASED ON A 300-DAY YEAR IN VARIOUS MINES

Class of Mines	Actual days worked	Deaths per thousand employees	Deaths per thousand calculated on 300-day basis
Copper.....	308	5.33	5.19
Iron.....	277	4.29	4.65
Lead and zinc (Mississippi Valley).....	256	3.43	4.02
Gold and miscellaneous metals.....	276	3.95	4.30
Non-metal except coal.....	258	1.73	2.01
All mines except coal.....	282	4.19	4.45
Coal mines.....	220	3.73	5.09
Quarries.....	228	1.69	2.22

Mr. Fay defined a quarry as a place where building material is obtained. Cement rock and broken stone, as well as dressed rock, is regarded as being the product of a quarry.

Other figures given by Mr. Fay are interesting:

LOSS OF LIFE PER MILLION TONS OF MATERIAL PRODUCED

Mines	Lives lost per million tons extracted	Lives lost per million dollars worth of product
Copper.....	7.96	1.74
Iron.....	4.29	0.60
Lead and zinc (Mississippi Valley).....	2.99	1.18
Miscellaneous mines (Gold and silver and others).....	12.58	1.12
Other non-metal except coal.....	3.53	0.60
All mines except coal.....	6.16	0.97
Coal.....	5.48	4.37

Mr. Fay presented the following figures which err, we believe, in the direction of liberality. Every life lost is figured as worth \$5000. The time lost is calculated on a 30-day basis and the wage of the miner at \$3 per day.

LOSS IN MINING FROM ACCIDENT AND DEATH PER ANNUM

Death of metal miners.....	\$3,000,000
Accidents of metal miners.....	1,000,000
Total.....	\$4,000,000
Deaths and accidents of coal miners.....	\$14,000,000
Deaths and accidents to quarry men.....	1,000,000
Grand total.....	\$20,000,000

Taking the grand aggregate of men employed as one million, the loss is \$20 per employee.

The speaker laid much stress on the number of blasting accidents and said that regulation by inspectors would largely reduce them as it had such accidents in coal mines. The blasts in metal mines are, however, much larger and more severe than in coal mines. Certainly, except where shotfirers are employed, the men who fire shots in coal mines are not superior to those who fire them in metal mines.

Moreover, even where shotfirers are engaged, the holes are usually loaded by the rank and file of operatives and not by expert men. The difference in death rate is largely due to the fact that coal-mine shots are small and single, whereas metal mines more usually explode larger shots and several at a single time.

PRECAUTIONS IN NEW YORK AQUEDUCTS

John R. Healy, assistant engineer of the Board of Water Supply of the City of New York, described some precautions taken to prevent accidents in the tunnel work.

All the men who load and fire shot holes have been examined and certified by the Bureau of Combustibles. All explosives used are non-freezing and the amount needed for each day's work (about half a ton) is stored underground in a magazine connected by a z-shaped passage 40 ft. long closed by a heavy door. The caps are kept apart from the explosives in a recess in the passage.

Where 20 to 25 holes are exploded in three rounds, only those holes which are exploded in one round are loaded at any one time. All firing is by electricity and the switch box controlling the ignition is kept locked, the foreman keeping the key. The field force of the Board of Water Supply examines the roof, the work not being left solely to the contractor's vigilance.

Care is taken to make the shafts larger near the surface so as to avoid material falling at the sides. Doors are placed in the shaft to prevent concrete falling down on the men below. Some contractors have put life nets below the men who were engaged in concreting. Others tried to hold them by life-lines and had a strike on their hands.

It is rumored that despite all the precautions, the death rate on the aqueduct is extremely high, but Mr. Healy gave no statistics on this subject. As usual, several men have died from sheer foolishness. One man ran his motor into the shaft. The cager instead of stopping the cage jumped into the shaft to save him and was killed. Many men too eager to get home left the air locks before the required time and thus died of the "bends."

A COMPETITOR OF THE MINE SCREEN

A paper was read by Thomas B. Stearns, of Denver, Colo., on the "McKesson-Rice Screenless Sizer. This machine operates on the following principles: (1) The largest particles roll furthest down an inclined plane; (2) if a sidewise reciprocating motion is given such a plane, the particles follow paths diverging like a fan. The smaller particles are carried further across the plane than the larger and may leave it on the side. (3) Particles on a plane broken into steps can be made to move across that plane opposite the direction of motion. (4) Particles will move with facility down a series of corrugations if the perpendiculars from their centers of gravity clear their summits. By arranging the corrugations on any one of a series of steps, it can be provided that particles of a certain size cannot travel down a plane but must travel in the direction of corrugation, whereas large particles will run quite freely, passing over the summits of the roughnesses.

As a result without the use of screens, as many as 15 different sizes have been obtained in the preparation of abrasive material for the manufacture of sand-paper, the material being taken from the bottom and side of the stepped plane. These sizings were on exhibit and photos of coal preparation were also shown. The method is of value because there are no screens to wear out, the power required is small, but little space is required, the abrasion of the material is reduced, owing to the shortness of the reciprocation of the table and to reduced travel of the coal as compared with those motions on a screen. Moreover, the coal is not in so deep a bed nor is it tossed as in a screen. Hence the abrasion is reduced to a minimum. It is hoped that the soft coal can be prepared more cheaply, less wastefully, in smaller space and more acceptably than by the present screening methods. At the same time the inventors do not wish to place the machine on the market till further experiments have been made.

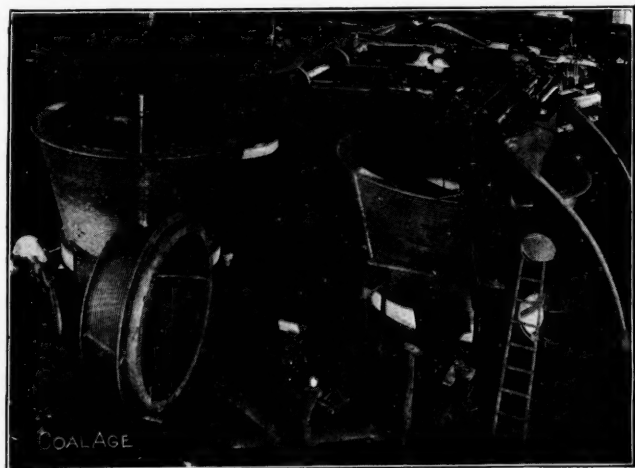
Solving the Hoisting Problem

By L. F. MITTEN*

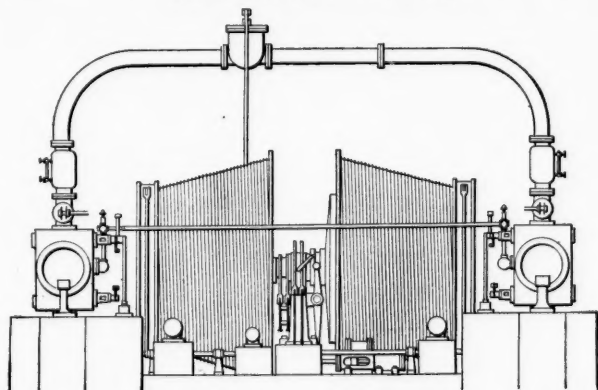
SYNOPSIS—Description of a Corliss valve hoisting engine of large size. The first few revolutions are made with a late cutoff and the Corliss gear disconnected. When full speed has been attained, a complete advance of the throttle throws the trip motion into gear and steam is used expansively throughout the balance of the hoist.

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One of the evidences of the changing conditions in the coal fields as regards economy and efficiency of equipment is shown by the steady increase in the demand for hoisting engines of low steam consumption. The accompanying illustration shows a 34x48-in. first-motion, link-reversing, heavy-duty, Corliss type of hoisting engine



THE CONICAL DRUMS ON THE ERECTING FLOOR. NOTE COMPARATIVE SIZE OF MAN



REAR AND SIDE VIEW OF CORLISS HOISTING ENGINE

secure less expensive equipment that would do the work for the time being and which could be easily and cheaply replaced when necessary.

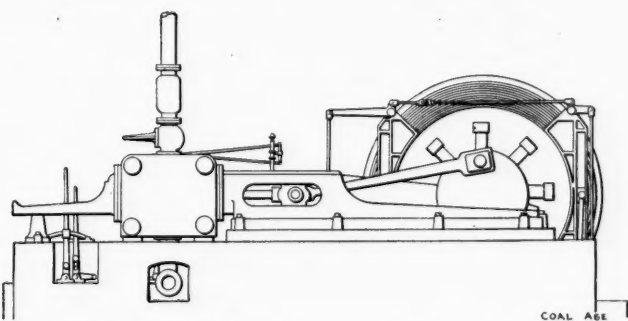
These were the conditions that manufacturers of high-grade machinery had to face, and the fact that the older types of extravagant hoisting engines are being replaced by equipment which is thoroughly modern and efficient, shows clearly the trend of the times and makes a description of the hoist mentioned above of interest to all mine owners and managers.

These engines are equipped with two conical drums, each tapering from 14 to 10 ft. in diameter and spirally grooved for 1½-in. rope. One drum is securely keyed to the engine shaft, while the other is brass bushed and driven by a toothed clutch wheel to allow for changing for different levels. The engines are reversed by an independent steam cylinder and the brakes on each drum are operated by this same means. Auxiliary hand brakes are also provided.

The engines are equipped with tail crossheads which take the weight of the pistons off from the inner surface of the cylinder and prevent the ordinary elliptical wear. Sheet steel crank and splash guards are furnished which cover entirely the crank disks. Guards are also provided for the tail crossheads.

The arrangement of throttles differs from the general practice followed in the coal regions. On top of each cylinder is mounted a vertical throttle valve. These are operated simultaneously through a crossshaft. Surmounting each throttle is a steam separator and an auxiliary throttle, which is used in case of emergency, is mounted in the overhead pipe line.

The valve motion is of the full Corliss type provided with dash pots. The cylinders are fitted with Vulcan



COAL AGE

built by the Vulcan Iron Works, of Wilkes-Barre, Penn., for installation by the Coal Mining Department of the Delaware, Lackawanna & Western R.R. Co.

A few years ago hoisting engines of this type were exceedingly rare in the coal regions. Fuel was, or was thought to be, cheap, ranging in estimated value from 75c. to \$1 per ton, and economy of operation was therefore given practically no consideration. Operators could not see the wisdom of investing any considerable amount of money in expensive machinery merely for the sake of saving a few tons of cheap fuel when they could

improved releasing valve gears and the actuating catches are a combination of the hand adjusted spring and gravity types. The trip or releasing motion instead of being controlled by the ordinary type of Corliss governor is operated from the throttle lever.

The first two or three revolutions of the engine are made with a late cutoff, the throttle being only partially open. A complete advance of the hand lever after full speed has been attained throws into gear the trip motion and the engine then uses steam expansively for the balance of the hoist. The cylinders are also fitted with a bypass arrangement allowing the engineer to lower a load

*Wilkes-Barre, Penn.

under compression, a foot pedal being conveniently located for this service.

The engines are designed to handle 100 cars per hour in a vertical shaft having a present depth of 900 ft. but which will ultimately be increased to approximately 1575 ft. Cars will be hoisted from the lower level to the top of the tower in self-dumping cages. These will weigh approximately 13,000 lb. The empty cars will weigh 5000 lb. and the coal 8000 lb.

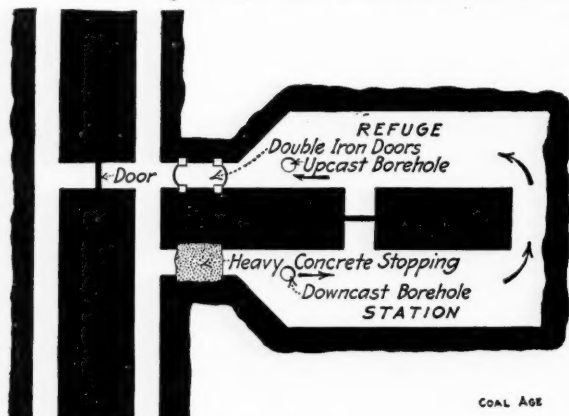
Some idea of the size of this installation is to be gained from reference to the photograph of two of the conical drums taken while in the erecting shop. Each section of these drums together with the drum siders weighs approximately 40 tons.

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Refuge Stations in Mines

BY JAMES E. SMITH*

There are too many lives destroyed in mines by explosions and otherwise and I feel satisfied that sixty per cent. of these lives could and would be saved if they only had some place of safety where they could retreat. As is well known, an explosion destroys everything in its path and its path is towards the shafts which is the only relief for the blast. Invariably there are miners who are not injured and knowing there is no escape they have to wait for the consequences, which is death from afterdamp.



PLAN OF PROPOSED REFUGE STATION IN A MINE

I claim that these miners' lives can be saved if suitable refuge stations were installed in the mines. The nearer to the working faces these stations are located, the better chance the miners will have to reach them. These stations should be ventilated by one, or better two, boreholes, say eight, ten, or twelve inches in diameter. If but one borehole is used it will be necessary to insert a four-, five- or six-inch pipe inside of the larger casing, and connect this pipe with a small air compressor or blower on the surface to ventilate the chamber, the air returning up the larger casing.

Such safety stations may be made by driving a pair of rooms, as shown in the accompanying figure, off the inside cross entries, or at any suitable place in the mine; the width of the rooms to be determined by the character of the roof and floor. The necks of the rooms should be driven in narrow, about twenty feet, and then widened. Two boiler-iron doors are to be placed in one of the room necks, about ten feet apart, a strip of asbestos being attached to the door where it meets the frame.

*Peoria, Ill.

The other neck is closed by a heavy concrete stopping, as shown in the figure.

The door frames are to be constructed of concrete, cut in the bottom 6 in. and showing a face of 4 in. above the floor; the top frame cut in the roof 6 in. and showing a face of 4 in. below the roof; the side frames to be cut in the pillars 18 in., showing a face of 4 in. outside of the pillar; the whole frame to be at least two feet thick.

A drill hole is sunk from the surface to each of the two rooms; all surface water is shut off. A common blower placed on the surface can be attached to the pipe at a moment's notice so as to furnish sufficient air to sustain life for a large body of men, until they can be reached with safety from the surface. This pipe can also be used for the purpose of furnishing the men with food and water and sending messages back and forth. A telephone can be placed in the chamber so as to communicate with the office on the surface.

The doors of said chamber should be semi-circular in shape and open in opposite directions, one to resist pressure and the other to resist any suction that may occur and both to be air-tight. Everything being fireproof, if there is any danger of fire in the mine you may at once cover up the shafts. There is no need of men going in search of life and losing their own lives in the effort, as was done at Cherry and other places. If this device had been used in the Cherry mine before the fire, not a man of the four hundred would have been lost; or the same in the mine at Delagua, Colo., where but one man was mutilated and twenty-nine men were found dead in one chamber from the effects of afterdamp.

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Revision of Mining Laws in Washington State*

The legislature of 1911 provided for the appointment of a commission to revise the law regulating the operation of coal mines, the commission to consist of, one coal-mine operator, one mining engineer, two practical coal miners and the state coal-mine inspector. The first four named above were to be appointed by the governor and the fifth was a member *ex-officio*.

The following persons were appointed by Gov. M. E. Hay: Coal-mine operator, F. A. Hill, Seattle; mining engineer, J. B. Warriner, Tacoma; miners, George Temperly, Roslyn, and Peter McLean, Wilkeson; and state mine inspector, D. C. Botting, Seattle.

After the commission had held two meetings, Mr. McLean was taken seriously ill and at his request further meetings were postponed. He finally resigned and Frank Bennett, of Roslyn, was appointed to fill the vacancy. Mr. Warriner resigned, October, 1912, to accept a position with a mining company in Pennsylvania; and C. R. Claghorn, E. M., was appointed in his place.

This commission has endeavored to compile a code that will work out along practical lines, and it is to be hoped that the members of the 1913 legislature will include it among the laws passed. It has been prepared after careful study and the members of the commission are certain that in placing it on the statutes, the safety to life, limb, health and property of men engaged in this industry will be greatly enhanced.

*From the advance sheets of the Report of the State Inspector of Mines, for 1912.

EDITORIALS

The Anthracite Mining Code

Mining men throughout the State of Pennsylvania are watching with much anxiety the doings of the legislature now in session in that state. The commission to revise and codify the anthracite mining laws of Pennsylvania, appointed by Governor Tener, under the Act of June 14, 1911, which act directed the commission to report its deliberations and recommendations to the next General Assembly (session of 1913), submitted two reports, differing from each other in important points. The majority report was signed by six members of the commission; the remaining three members submitting a minority report, which was seemingly inspired, in some of its provisions at least, by influences emanating from the United Mine Workers' organization.

Both of these reports were referred promptly to the Committee on Mines and Mining. The majority report received the first attention of the committee, and after prolonged consideration was reported out, having been amended by the committee in a few unimportant matters that were agreed to by those who signed the report. Later, Apr. 22, the minority report was reported favorably to the House, by the committee. It is understood that this minority report was signed by the three members of the commission chosen from the mine workers of the anthracite region.

One of the prominent features of the minority report, in which it differs from the majority report, is the provision made in Article 15, that the mine inspectors of the anthracite region shall be elected by "the qualified electors of the several inspection districts."

The law under which the anthracite mine inspectors of Pennsylvania have been elected by popular vote in their several districts, has been clearly proven to be one of the most pernicious features of the state mining law, during the decade in which it has been in force. The majority report of the commission seeks, in Article 9, Section 6, to change this condition by providing that all anthracite mine inspectors shall be commissioned by the governor from the certified list furnished him by the examining board, in the order of the percentage mark received by the candidate in the examination. So much has been written in regard to the relative advantages of the appointed and elective systems in the choice of mine inspectors, that nothing is to be gained by further comment, but the hope is expressed that the present legislative session will mark a change in the present law, in this respect.

We will mention briefly one other feature of the minority report that in itself should be sufficient to kill the bill. We refer to the provision made in Article 15, Section 8, that "All persons holding mine foremen certificates shall be eligible to run for the office of mine inspector." According to this section, all that is required of the candidate for the office of mine inspector is that "he shall file his mine-foreman certificate with the county commissioners in the county in which he resides. After

the filing of such certificate with the county commissioners, his name shall be placed on the official ballot." Such a wild and random provision as this needs no comment. Its enactment as law would overthrow the work of a quarter of a century in the effort to secure greater safety in coal mining in Pennsylvania.

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Failure To Put On Breathing Apparatus

A warning example of the danger that may be present to rescue parties equipped with breathing apparatus in perfectly good condition, if the same be not properly employed, may be found in a fatal accident which occurred last November at the Möller mine in the Glädbeck inspection district, Germany. It is the subject of a leading article by Dr. Forstmann in *Glückauf*, April 6, 1913.

Hearing there was a fire in the mine, a party of sub-officials started toward the affected region with breathing apparatus. Three of them, while passing along galleries but faintly permeated by gases from the fire, neglected to use the apparatus, and after awhile sickened, one of them collapsing so as to prevent his going farther. The other two put on breathing apparatus and proceeded. In about an hour they became exhausted and, although a retreat was attempted, they were unable to reach a place of safety.

Their death was shown to be caused by poisoning with carbon monoxide. The effect of the gas which they inhaled at first had apparently been aggravated by their subsequent exertions. It is thought also that one of them neglected to use his second oxygen flask. Neither of the victims belonged to a regular rescue team.

This accident teaches that gases of combustion which are so attenuated as to seem negligible may nevertheless be poisonous and should not be entered without wearing a breathing apparatus.

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Coming Substitute for Natural Gas

Modern development of almost every type of mechanical apparatus is along lines of simplicity and economy. With proper design, simplicity means durability; durability means low maintenance and low maintenance means cheaper cost of operation.

The tendency toward simplicity in design is well illustrated in the improvement of the internal-combustion engine. Many of us can well recall the first of these machines to be placed upon the market. But our memories of these engines are that they were a mass of cams, springs, valve rods, etc.; that they were extremely heavy for their horsepower and noisy in almost a like proportion.

After a period of development that has been comparatively short, they are now one of the simplest, most elastic and most responsive machines known, as well as being the lightest of all prime movers for their power. For this reason perhaps more than any other, they have been

the most highly developed in the smaller horsepowers and have served man rather as a plaything and a toy—driving his motor boats, his automobiles and aeroplanes with equal facility—than finding any conspicuous place in industrial or manufacturing institutions.

Although at the present time stationary gas engines are made in 5000-hp. sizes, yet the development of this type of machine is still in its infancy, perhaps not so much in the mechanical construction of the mechanism itself as in the perfection of the means and methods of preparing the engine fuel.

In thermodynamic efficiency, the internal combustion engine is at least the equal, if not the superior, of steam-actuated power-generating apparatus. In the light of our present experience and achievement, it is not too much to hope that at no remote date, means will be developed for successfully producing high-grade engine fuel from inferior and inexpensive coal or lignite. When this result is commercially accomplished, we need have no fear of embarrassment or inconvenience on account of our steadily failing supply of natural gas.

❖

The Load Factor

The paper of H. M. Warren and A. S. Biesecker before the American Institute of Electrical Engineers, published in this issue, was met with no little criticism largely because the authors defined the "load factor" for the purpose of the paper as the average load on the converter increased by the converter losses divided by the rating of the connected units whether idle or working.

The argument of the objectors was that the load factor should have no relation to the possible bad judgment which any operator had exercised in buying machinery which either he did not need or which was too powerful for his purpose.

It was pointed out that the factor, as defined by the authors, rested on the balance which machine purchase and mine development had struck between facilities needed and machinery supplied. The equipment might be excessive or might be inadequate, but the "power factor" should only express the relation between the average energy needs of the equipment with the energy needed at moments of excessive demand.

A furniture maker was instanced whose construction engineer had a contract based on the total cost of installation. In order to swell his percentage return, the consulting engineer bought equipment which greatly exceeded all the legitimate needs of a plant employing a given number of employees. Consequently had one diligently totaled the ratings on the name plates, the denominator of the ratio would have been high and the power factor correspondingly low. Such a factory would appear to be undesirable as a power customer, whereas the fact that it used almost equal quantities of power throughout the day made it a client to be sought.

The public central-station authorities favored comparing the greatest momentary demands of the station, that is the peak of the load with the average needs of the same period. This is a good method when, having built a central station of a certain size, arrangements are made to supply a number of independent concerns. But where a central station, private or public, is started to accommodate a definite number of companies, the problem is different.

It is presumable that the requirements of the various operators will be better known to them than to the power seller. On the strength of the knowledge which they should be presumed to have, they bought machinery of certain ratings. Because the central-station authorities do not know more and may actually know less than the mine-operating department regarding the mine's needs, the equipment purchased for the central station will be based inevitably on a certain function of the installed load, whether the power house is public or private.

Consequently the station equipment is bought for certain anticipated demands and the cost of construction is based on the mine machinery bought by the power-purchasing concerns, who may be independent or the owners of the station. Hence the relation of the load borne to the load expected is a ratio of no little commercial importance. A certain percentage of variation between provision and use has been expected and allowance has doubtless been made for it, but every further variation means a decrease in the expected income.

This then is the value of the Warren-Biesecker figures, They supply the basis which will make the probable factor apparent, whether it be termed load, use or service factor or what not. Clearly the operator is going to put in so many units to perform the colliery work and obviously he desires to know how large must be the units by which they are to be supplied with energy. If he does not know what the average load will be, how can he discover what is the peak load which must be met even if he has the relating factor. He might have a factor connecting average load with rating units and then a factor connecting that average with the peak load, but the Warren-Biesecker factor, to give it a title which no cavalier can condemn, combines both these requirements in a single figure.

It is an uncertain factor, and to be used with caution as indeed are many others. But the authors have found it checks remarkably well in their Lackawanna practice, so closely indeed as to occasion surprise. Not how close the factor of the largest station is to the average. In fact mining practice is stereotyped, especially in any one region, and the needs are much alike. This keeps the Warren-Biesecker factors from excessive variation when taken for equal durations of time. As a rule, mine installations are rather inadequate than excessive and machinery is rarely bought before it is needed.

It would have been equally justifiable to attack the paper on the grounds that the coal mines on which the inquiry was based might be so different from others as to furnish no criterion. Clearly if the installation is not to be declared non-typical because it might be found too large or too small for the work required of it, it might also be objected to as abnormal because used in a manner not typical and then if the load factor demanded by the critics were obtained the result would not be of any value in professional practice. In short the objections to either kind of factor on the ground of uncertainty are at least equal and in addition the factor which the central-station agents demand will not serve the purpose which the authors of the paper were seeking.

The electrical experts may bicker on definitions, but the conclusions reached in the paper are valuable, despite the verbal criticisms of detractors. The authors were not trying to explain the fairest way in which to sell power from a plant already purchased in Chicago, Ill.

DISCUSSION BY READERS

Letter No. 11—The training and education of mining men for the different positions they desire to hold in the mine, must always be adapted to their particular line of work. Drivers, motormen, miners, trackmen, timbermen, electricians, firebosses, steam engineers, surveyors, mine foremen and superintendents should undoubtedly each be trained and educated in their own line of work; but the more information each is able to gain of the other man's work, the more liable he is to advance to a higher position. All mine foremen are on the lookout for bright young men, whom they are pretty sure to advance, provided the man keeps sober and is willing to study.

Training for the position a man occupies is absolutely necessary, and, in my opinion, the greater a man's theoretical knowledge, the more efficient workman he will become. I believe this is true of all grades of mining work, from driver to superintendent. Any miner who has learned to cut coal to the cleavage, one cleat at a time; the trackman who understands curves and gradients, and knows the proper radius for certain mine curves; electricians who know the value of insulation; firemen who know how to keep a thin fire; and mine foremen who can control the ventilation and drainage of a mine and adopt a successful method of working the coal, are the men who are the most valuable, because of the knowledge they possess. Although there are many good men who know little of these things and yet do good work, I am convinced they would do better work if they had a technical knowledge and training.

The position of mine foreman or underground manager requires, perhaps, the broadest information and the best skill and training of any position in the mine, because of the numerous conditions met underground and the difficult problems that must be solved. The mine foreman must understand the constitution and behavior of mine gases; nature of roofs and bottom; the peculiarity of cleavages in the roof and coal. He must possess a knowledge of the flow of fluids; steam, compressed air and electricity; and the application of each of these forms of power to pumping, drainage, ventilation and haulage. He must understand the mining of coal by hand and machine. He must be able to study carefully and successfully the problem of transporting the coal from the face to the tippie. He must be able to handle his men so as to produce dividends.

Hundreds of good men have qualified for these positions in Pennsylvania, Illinois, West Virginia and other states, thus far, without carrying textbooks to the examinations. I can see no reason why this should be done. In my opinion, it is easy to master any of the subjects in mining without the use of any difficult formula or theory. Why then "lower the bars" to admit men who will not study or try to educate themselves.

I remember when first married I could not work a long-division problem. I worked eight hours each day in the mine and studied a like time at night to pass the examination, and I feel I know the value of study. I have never since given up the study of mining subjects or

laid my books aside, and I believe there are not 10 per cent. of the mine foremen in Pennsylvania and West Virginia who cannot say the same thing.

However, I do believe that mining examinations should be conducted along practical lines. I do not think it is necessary for examiners to ask how air would split itself up in five splits of given dimensions, from the same fan. In the mine, the foreman makes these splits and divides the air according to the conditions, using the anemometer for this purpose.

If a formula is needed to answer a question, in examination, I think the formula should be given with the question. I believe the introduction of textbooks in examinations would hurt the very persons they were intended to help. In any examination, there is always those who would take advantage of being allowed the use of textbooks and would pass a good examination but have little practical knowledge and less practical ability.

JOSEPH VIRGIN, Supt.

Bancroft, W. Va.

Letter No. 12—The discussion of this question by the readers of COAL AGE leads me to offer the following remarks: The most pressing need of the practical coal miner who is ambitious to acquire an education in his line, is the possession of mining books and papers that will give him the information he wants, in the plainest manner and the simplest language possible. The time a miner can devote to study is limited, and it is important that he should reap the largest returns from his reading and study.

The object of textbooks and mining journals is largely educational and while it may be necessary that in order to meet the requirements of a certain class of technical and scientific readers the writer should express himself in language suitable to that class, it is equally if not more necessary that articles written for the common reader should be expressed in words that he can understand with the least possible effort. In reading many of the articles and books on mining it is necessary for a reader of limited knowledge to refer constantly to a dictionary of scientific terms, in order to understand what he reads. Again, some sentences must be read over several times before one can fully comprehend their real meaning. The result is that the ordinary reader becomes wearied with the effort and the book or journal is thrown aside in disgust.

Without questioning the fact that the writers of most of the articles in our mining journals and of mining textbooks are practical mining men, it may be stated that the language they often use is more characteristic of their scientific than of their practical training. It is this feature that makes their writings so obscure and difficult for the average practical mining man to comprehend.

The majority of the readers of our mining journals and textbooks are men engaged in the actual operation of producing coal. Their daily labor is arduous and dangerous. The conditions under which they work are not such as to train the mind. In many cases, their early edu-

cation has been neglected. If such men can realize the need and importance of education and come to know that "knowledge is power," and that the possession of it will benefit both themselves and their fellow workers, it is only right and just to give them the fullest possible returns for the time and money they expend.

I have reached this conclusion, after conversation with miners and practical mining men in every official capacity and as a result of my own personal experience. The reason that so many mining journals and textbooks fail to interest practical men is because they fail to educate in a way that is easily understood. The principles of mining expressed in simple terms would be of untold value to practical mining men; and authors and writers should realize, when writing, that there are thousands of eager hungry minds waiting and anxious to absorb this mental food.

I. C. PARFITT.

Jerome, Penn.

Letter No. 13—The average mining man who takes up the study of coal mining today is burdened with masses of figures and formulas that look like Greek or Hebrew to his untrained mind. The course of study usually laid out for his guidance commences with the rudiments of arithmetic. If the man is possessed of extraordinary will power, he continues to study arithmetic (the hardest and driest of all studies) until he has mastered fractions, percentage, extraction of roots, the use of sines, cosines, etc., and algebraic formulas. It usually takes the average mining man from one to two years to master these rudiments, which must be done before he can take up the study of gases, pumping, track laying, haulage, ventilation, safety lamps, etc. As a result, he often becomes disgusted before completing mathematics.

I believe it is as important to make the line of study in mining interesting, as to make it instructive. To do this, it is necessary to inject into the course some elementary information on gases, air, steam, electricity, first-aid and drawing. This would rob study of much of its terror, because such information would hold the interest of the student while it broadens his conception.

I do not favor the use of textbooks in examinations. I believe in a high educational standard for mining examinations. Raise the standard of mining up to that of the most modern practice and bring the examination to that standard. Require that all applicants pass this test, but do not lower the examinations to a level where no study, sacrifice or effort is needed, except a few days' or a few weeks' study before the examination.

Much can be said, by way of criticism, of the character of the questions asked at many mining examinations. These questions often fail to state definitely the conditions, and therefore admit of different answers, according to the conditions assumed by the candidate. In such cases, the solution given by the candidate will often be different from that required by the board. If the board has the time, it may be considerate enough to give the candidate credit for his work, as far as that shows he had the right idea. The candidate may have used a different coefficient of friction, or a different constant for the flow of water through pipes, or a different rule for calculating the size of the shaft pillar at a certain depth below the surface. Again, the answer obtained will differ with the number of decimal places to which the work is carried.

Many questions asked depend solely upon the judgment of the person and, as men differ widely in their judgment, the answers to such questions will rarely prove satisfactory to the members of the board. Questions that pertain to particularly local conditions should be carefully stated; because conditions differ widely in different mining districts, and practice in one district would not be successful in another district.

I am in favor of rating each question by stating the percentage or number of points allowed for the correct answer. I believe the board ought always to state the coefficient of friction that should be used or the constant that will be accepted where different constants are used; also the number of decimal places the solution should be carried.

It is quite generally true that many successful candidates in mining examinations, lay by their studies when the examination is over, intending to renew them after a brief rest. Their inclination to study, however, grows less and less as time goes on. Such men will fall behind and give place to more ambitious men.

At the present time, there are many good schools and other means of obtaining a technical education at low cost, either by studying or reading. These give the ambitious worker every advantage and he has no excuse if he fails to avail himself of the privileges they extend. The mine worker who continues to study and read will soon be fitted for a higher position in the mining field, where many conditions will consume his attention, such as profit and loss in business, division of costs, the upkeep of property, taxes, sanitary, social and labor conditions. All of these will form an interesting study as the man advances and his fund of knowledge increases.

It is common to find many persons holding high positions, by personal favor rather than by merit. The number of these, I am glad to say, is rapidly decreasing. There is no better means for protecting these positions or preventing men who are incapable from holding them, than to require a test of competency as determined by an examination.

I believe these examinations should be periodic, and that they should be required for the renewal of certificates for mine foremen and firebosses. I also believe that all mine superintendents should undergo a more severe examination than the mine foreman and be certified by law for the position he holds.

R. Z. VIRGIN, Supt.,
West Virginia-Pittsburgh Coal Co.

Colliers, W. Va.

Letter No. 14—I have been much interested in reading the letters on the subject of Education In Coal Mining, particularly those portions relating to the use of textbooks in examination. I am one of the great number who did not acquire a good, common-school education, in my younger days; but have since educated myself by correspondence and now hold a fireboss certificate and a first-grade mine-foreman certificate, for the bituminous mines of Pennsylvania.

Mining is a very extensive study, which we can never hope to master completely; for there is always something new to learn in the way of improved methods, machinery, etc. The best mining men today are those who keep themselves posted by reading up-to-date mining literature. It is by such constant study we become familiar with the

principles and formulas relating to the science of mining. A man's knowledge of the mine law and his practical experience in the mine should give him a good idea of the kind of questions that ought to be asked at the different examinations. This makes it possible for good mining men to qualify, in a short period of time, for any examination.

It is not necessary for a person to remember all the formulas, but he should remember the principal ones and learn how to transpose those formulas so as to find the value of any of the quantities required. In my opinion, no first-class mining man would ever require a textbook in an examination. If he has the proper qualifications for the position, he should have no trouble in passing the examination without the aid of a textbook. I cannot understand how good mining men would advocate the use of textbooks in examinations; as, in my opinion, this would tend to lower the standard of examinations. But, if we are to economize in the production of coal and reduce the number of accidents in the mine, we must increase the standard.

I think that all firebosses, mine foremen and superintendents should be examined at least every four years, in order to bring the standard up to a maximum; because the lives of the miners depend, to a large extent, upon these officials and the knowledge they possess of mining. In my opinion, it would be a good investment for every

large coal-mining company, operating several mines in the same town, or a number of small companies operating mines in the same community, to open and maintain a room for the purpose of educating their employees.

It often happens that miners are more or less prejudiced in their minds against their employers and think that many things that they do are done for the sole purpose of robbing them. It is a hard matter to get men who have only a limited education to take up the study of mining, but this can be accomplished if night schools were opened and maintained by the corporations operating in a community, provided that the mine officials themselves attended the meetings and did all in their power to instruct and interest the miners. This work should be followed up by the practice of selecting the most capable men among the miners to fill the different positions.

BENJAMIN HARTILL.

Johnstown, Penn.

Note—In response to many repeated requests, we have given a few pages of purely elementary matter in the Pocket Book section. The greatest care has been devoted to the work to make it simple and clear. The purpose is to provide a handbook that will contain all and only such matter as is necessary for practical mining men to know and to use. Such elementary matter, while familiar to many, is not without value to all. In order, however, to give more advanced work, for students of higher grade, and to publish, at frequent intervals, lessons, formulas and data suitable to all, the pocketbook pages will follow no regular order at present. Later, the same pages will be arranged and, together with many tables and other matter that obviously could not appear here, will be published as one of the most valuable mining handbooks yet produced. We cordially invite criticism and suggestions.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

The order of notation is important. Beginning with units on the right the numerical value of each succeeding place to the left increases in the ratio of ten. For example, any digit, 1, 2, 3, etc., standing in the first place on the right, means 1, 2, 3, etc., units. The same digit standing in the second place means ten 10, twenty 20, thirty 30, etc., units. In other words, the value of the digit has increased ten times. If the same digit stands in the third place, counting from the right, its value is increased ten times again or one hundred times that number of units.

The order of notation is given below and should be carefully studied. In ordinary computations it is seldom necessary to go higher than millions or billions, at the most.

Hundreds of billions	Tens of billions	Billions	Hundreds of millions	Tens of millions	Millions	Hundreds of thousands	Tens of thousands	Thousands	Hundreds	Tens	Units	
100,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	One hundred billion
10,000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	Ten billion
1,000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	One billion
	100,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	One hundred million
	10,000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	Ten million
	1,000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	One million
		100,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	One hundred thousand
		10,000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	Ten thousand
		1,000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	One thousand
			100,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	One hundred
			10,000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	Ten
			1,000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	000,000,000,000	One

These four periods of three figures each are, counting from right to left, hundreds, thousands, millions, billions.

In writing large numbers composed of several figures, it is necessary to fill all void places with ciphers, as the following examples will show.

EXAMPLES TO ILLUSTRATE

1. Write twenty-five, which is two tens and five units.....	25
2. Write three hundred and twenty.....	320
3. Write seven thousand and twenty-five.....	7,025
4. Write seven thousand and five.....	7,005
5. Write seven thousand and fifty.....	7,050
6. Write ninety-six thousand, eight hundred and ten.....	96,810
7. Write two hundred and sixty thousand, one hundred.....	260,100
8. Write twenty-one million, three hundred and two.....	21,000,302
9. Write four billion, sixty-one million, two thousand and nine.....	4,061,002,009
10. Write one hundred and fifty billion, sixty million, and four.....	150,060,000,004

The Coal Age Pocket Book

ADDITION

The operation of finding the sum of two or more numbers is called "addition," and the numbers are said to be added together. The sign of addition (+) is called "plus," and when written between two numbers indicates they are to be added together.

Sign of Equality—The sign of equality (=) written between quantities indicates that their values are equal.

To Add Numbers—Numbers are often added by counting on the ten fingers of the two hands. It was probably this early custom that originated the decimal system and gave us the ten characters—nine digits and cipher. The word "digit" means a finger; hence, the name, as applied to the nine digits, while the cipher served as a tally of the count.

To illustrate, add together two fingers and four fingers by counting as shown in Fig. 1. This is written $2 + 4 = 6$

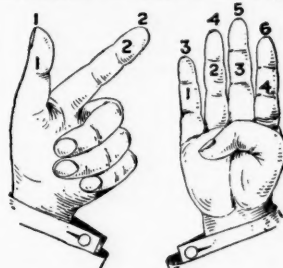


Fig. 1

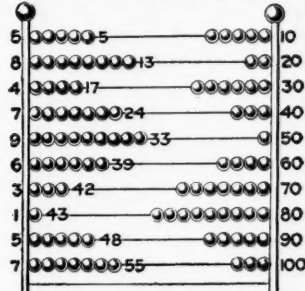


Fig. 2

fingers. When a number of figures are to be added together, a counting rack is sometimes used, similar to that shown in Fig. 2, which consists of a frame supporting ten wires on each of which are strung ten beads. The number of beads, corresponding to each figure to be added, is slid to the left side of the rack, on each wire in succession, after which the total number of beads on that side is counted. The final count gives the required sum. In Fig. 2, the figures to be added are

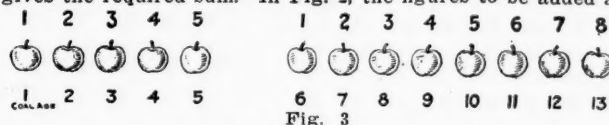


Fig. 3

written on the left and the count of each line is tallied on the wire, the final tally being 55, which is the sum required.

In the same manner, as illustrated in Fig. 3, five apples and eight apples make thirteen apples; thus, $5 + 8 = 13$.

EXAMINATION QUESTIONS

Ventilation

(Answered by Request)

Ques.—A 7x10-ft. airway is passing 35,000 cu.ft. of air per minute, and it is desired to reduce this quantity to 21,000 cu.ft. per min., by means of a regulator. The water-gage reading taken on the regulator being three-fourths inch, what must be the area of the opening in the regulator?

Ans.—Assuming that the given water gage (0.75 in.) is obtained at the regulator, after the volume of air has been reduced to 21,000 cu.ft. per min., the area of opening in the regulator is calculated as follows:

$$a = \frac{0.0004 q}{\sqrt{w.g.}} = \frac{0.0004 \times 21,000}{\sqrt{0.75}} = \frac{8.4}{0.866} = 9.7 \text{ sq.ft.}$$

Ques.—If two airways in a mine are increased to double their length, other conditions remaining the same, in what proportion must the ventilating pressure be increased to maintain the same velocity of the air current?

Ans.—The cross-section of these airways (area and perimeter) remaining unchanged, for a constant velocity, the pressure will vary as the length of the airway. Or, in this case, the pressure must be doubled to maintain the same velocity of the air current.

Ques.—If two ventilators producing the same power are used on the same airway, will they produce twice as much air as one ventilator? If not, how much more than one ventilator will the two ventilators produce?

Ans.—If the ventilators consume an equal power, and have the same efficiency, the power on the air when both are running will be double that when one ventilator is running alone. For the same conditions in the airways, the quantity of air in circulation varies as the cube root of the power; or, in this case, the quantity will vary as the cube root of two. Or, since $\sqrt[3]{2} = 1.26$, when these two ventilators are running the volume of air produced will be 1.26 times that produced by one ventilator alone. In other words, if one of the ventilators produces 10,000 cu.ft. of air, the two ventilators running together will produce 12,600 cu.ft. per minute.

Ques.—If the pressure required to pass 12,000 cu.ft. of air per min. through an open airway produces a water gage of 0.8 in., what will be the pressure required to blow 4000 cu.ft. of air per min. through a regulator fixed in what was previously the open airway?

Ans.—The first step is to find the natural water gage, or the water gage due to friction, when the air is reduced from 12,000 to 4000 cu.ft. per min. Since the pressure varies as the square of the quantity, the pressure ratio is equal to the square of the quantity ratio; hence,

$$\frac{w.g.}{0.8} = \left(\frac{4000}{12,000} \right)^2 = \left(\frac{1}{3} \right)^2 = \frac{1}{9}$$

$$w.g. = \frac{0.8}{9} = 0.09 \text{ in., nearly}$$

The question does not state whether the pressure or the power producing circulation remains unchanged. If the pressure producing the circulation remains constant, the water gage due to the regulator, in this case, is 0.8

— 0.09 = 0.71 in. Therefore, the pressure required to blow the air through the regulator is $5.2 \times 0.71 = 3.69$ lb. per sq.ft.

Assuming the power remains unchanged, the pressure varies inversely as the quantity of air in circulation; and when the air is reduced from 12,000 to 4000 cu.ft. per min., the pressure, or water gage, will be increased three times, making the water gage $3 \times 0.8 = 2.4$ in. In that case, the water gage due to the regulator is $2.4 - 0.09 = 2.31$ in. Therefore, the pressure absorbed by the regulator, when the power remains constant and 4000 cu.ft. of air is passing is $2.31 \times 5.2 =$ say 12 lb. per sq.ft.

Ques.—The area and length of an airway remaining unchanged, in what proportion must the power be increased in order to double the quantity of air?

Ans.—The formula for power, expressed in terms of the quantity of air in circulation, is

$$u = \frac{k l o q^3}{a^3}$$

For the same airway, the area (a), perimeter (o) and length (l) of the airway are unchanged; and, k being constant, the power (u) varies as the cube of the quantity (q^3). Therefore, to double the quantity will require $2^3 = 8$ times the power, provided the perimeter is constant. It is possible to change the form of an airway so as to have a different perimeter but the same area.

Ques.—For the same length of airway and quantity of air in circulation, if the area of the airway is doubled, how will this affect the power on the air?

Ans.—Writing the formula for the power in terms of the quantity of air in circulation,

$$u = \frac{k l o q^3}{a^3}$$

In this case, the length (l) and the quantity (q) being unchanged and k being constant, the power (u) varies as the expression a^3/o .

Any change in area will generally produce a change in perimeter of the airway. It is possible to assume two separate airways having the same perimeter and different areas; as, for example, an 8x8-ft. airway, 7x9-ft. airway, or a 6x10-ft. airway—all have the same perimeter but different areas; the perimeters in each case being 32 ft. and the areas 64, 63 and 60 sq.ft., respectively. Such a change can only be accomplished, in practice, by "ripping" the roof or "lifting" bottom and building the waste material at the side of the entry. For example, if 2 ft. of roof be taken down in a 6x10-ft. entry and a 2-ft. "building" be carried on one side of the roadway, the cross-section of the entry would be changed to 8x8 ft. The entry would then have the same perimeter, but the area would change from 60 to 64 sq.ft. It would be difficult to double the area and still keep the same perimeter, in practice.

However, assuming a constant perimeter, the power varies inversely as the cube of the area. Therefore, if the area is doubled, without changing the perimeter, there will be required only $1/2^3 = 1/8$ of the original power.

COAL AND COKE NEWS

Washington, D. C.

The Interstate Commerce Commission has just decided the case of the Sheridan Chamber of Commerce vs. the Chicago, Burlington & Quincy Ry. Co., et al, in which complaint was made of the rates on coal from Sheridan, Wyo., to points in Nebraska and South Dakota on the line of the Chicago & North Western and the Chicago, Milwaukee & St. Paul R.R., and to points east and west of Billings, Mont., on the line of the Northern Pacific.

Comparisons were made of distances and rates from Sheridan, Hudson, and from Illinois and Indiana coal fields to points of destination on the Chicago & North Western herein involved. Similar comparisons were made of distances and rates from Sheridan and Roundup, Mont., and from Illinois coal fields to points of destination on the Chicago, Milwaukee & St. Paul herein involved. Sheridan mines were found to be at a disadvantage of from 85 cents to \$1 in competing at points on the Northern Pacific with the mines located on that railroad. It was held that:

1. The great discrepancy between the rates from Sheridan and from Hudson to the same points of destination on the Chicago, Milwaukee & St. Paul and from Hudson to the same points of destination on the Chicago & North Western and between rates from Sheridan and Roundup to the same points of destination on the Chicago, Milwaukee & St. Paul cannot be justified on the ground that the movement from Sheridan involves a two-line haul.
2. Where the physical connection between connecting carriers is as simple as in these small western towns, involving no expensive terminal service, the additional cost due to the switching movement is small, so small in fact that it may not properly be made the basis of an additional charge for a two-line haul of substantial length.
3. The facts in these cases demonstrate the necessity of promulgating rates which will allow this coal to find a market in the territory described. In order to accomplish this result there must be a free interchange of traffic at reasonable joint rates.
4. Joint rates should be established from the mines at Sheridan to the points on the Chicago & North Western which have been specified in the complaint which should in no case exceed the rate from Hudson, Wyo., to the same points of destination, except that the rate to common points of the Chicago, Burlington & Quincy and the Chicago & North Western need not be changed.
5. A joint rate should be established from Sheridan to Chamberlain, S. D., not to exceed that from Roundup to Chamberlain and this rate should be carried back as far as Okaton, S. D.
6. A differential of 25 cents is a reasonable allowance for the difference in the distance from Sheridan and from the Northern Pacific mines to points of destination involved within 500 miles of Sheridan. As the distance to points of destination increases, the differential between the rates from Sheridan and from Red Lodge should be further contracted, so as not to exceed 15 cents to points between 500 and 600 miles distant and not to exceed 5 cents to points between 600 and 700 miles distant. To points over 700 miles distant the rate from Sheridan should be the same as the rate from Red Lodge.

Senator Kern's Resolutions

Senator Kern on April 12 offered a resolution regarding the West Virginia coal strike which has now been reported by Senator Williams from the Committee on Contingent Expenses in a completely amended form reading as follows:

Resolved, that the Senate Committee on Education and Labor is hereby authorized and directed to make a thorough and complete investigation of the conditions existing in the Paint Creek coal fields of West Virginia for the purpose of ascertaining:

First. Whether or not any system of peonage is maintained in said coal fields.

Second. Whether or not access to post offices is prevented; and if so, by whom.

Third. Whether or not the immigration laws of this country are being violated in the West Virginia coal fields; and if so, by whom.

Fourth. If any or all of those conditions exist, the causes leading up to such conditions.

Fifth. Whether or not the Commissioner of Labor or any other official or officials of the Government can be of service in adjusting such strike.

Sixth. Whether or not parties are being convicted and punished in violation of the laws of the United States.

Said committee or any subcommittee thereof is hereby empowered to sit and act during the session or recess of Congress or of either House thereof at such time and place as it may deem necessary; to require by subpoena or otherwise the attendance of witnesses and the production of papers, books, and documents; to employ stenographers, at a cost not exceeding \$1 per printed page, to take and make a record of all evidence taken and received by the committee and keep a record of its proceedings; to have such evidence, record, and other matter required by the committee printed.

The chairman of the committee or any member thereof may administer oaths to witnesses. Subpoenas for witnesses shall be issued under the signature of the chairman of the committee or subcommittee thereof. Every person who, having been summoned as a witness by authority of said committee or any subcommittee thereof, willfully makes default or who, having appeared, refuses to answer any questions pertinent to the investigation herein authorized shall be held to the penalties provided by section one hundred and two of the Revised Statutes of the United States.

The expenses thereof shall be paid from the contingent fund of the Senate on vouchers ordered by said committee, signed by the chairman thereof and approved by the Committee on Contingent Expenses.

Debate on Coal Tariff

During the debate on the tariff bill in the course of the past week under the five-minute rule, considerable attention was given to the section dealing with coal and an effort was made to secure the amendment of the tariff act relating to that subject. The idea of those who urged a change was expressed in the following paragraph which was offered as a substitute for the new tariff provision as contained in the Underwood bill.

Bituminous coal and shale, 40 cents per ton of 28 bushels, 80 lb. to the bushel; coal slack or culm, such as will pass through a half-inch screen, 15 cents per ton of 28 bushels, 80 lb. to the bushel: Provided, that the rate of 15 cents per ton herein designated for "coal slack or culm" shall be held to apply to importations of coal slack or culm produced and screened in the ordinary way, as such, and so shipped from the mine; coke, 20 per cent. ad valorem; compositions used for fuel in which coal or coal dust is the component material of chief value, whether in briquettes or other form, 20 per cent. ad valorem: Provided further, that on all coal imported into the United States, which is afterward used for fuel on board vessels propelled by steam and engaged in trade with foreign countries, or in trade between the Atlantic and Pacific ports of the United States, and which are registered under the laws of the United States, a drawback shall be allowed equal to the duty imposed by law upon such coal, and shall be paid under such regulations as the Secretary of the Treasury shall prescribe."

PENNSYLVANIA

Anthracite

Pottsville—Fifteen hundred men and boys struck at the Vulcan and Buck Mountain collieries of the Lehigh Valley Coal Co., Apr. 26. The cause of the strike was the refusal of the officials to grant the inside men an increase in wages for work where a safety lamp was demanded.

Wilkes-Barre—The mess house opened by the Lehigh Valley Coal Co. at its Prospect Colliery, on Jan. 16 of this year, has proved so great a success that applications have already been received by the company to establish such houses at three of its other collieries. Officials of the company report that from 75 to 100 men use the house regularly, and a number of them have formed a "Coffee Club," the members of which take turns in heating coffee for the crowd on the appliances provided for that purpose.

Shamokin—A tieup of collieries in this region, chiefly six operations controlled by the Mineral R.R. & Mining Co., laying between 7000 and 8000 men and boys idle, has been officially declared off, and the strikers are satisfied with results. The strike started on Apr. 22, at several collieries, and two days afterward all the mines along the Pennsylvania R.R., between Shamokin and Mt. Carmel, were tied up, excepting the Greenough colliery, controlled by individual operators. At that mine almost all the employees were union men with dues paid up.

Over 4 in. of rain has fallen in this section and a number of the collieries are in danger of being flooded by swollen mountain streams. It is said that if the rain continues the mules will be hoisted to the surface. All the company's pumps are in operation.

One thousand men in arrears at the collieries paid up their assessments, \$4000 being collected by the secretaries of locals. The Green Ridge and Richards Collieries, owned by the Mineral Company, are now "closed shops," according to the United Mine Workers.

Shenandoah—Seventy-five employees at strippings in this city have gone on strike because five of the employees failed to wear the union button.

The Susquehanna Coal Co. has recently equipped its William Penn colliery with the latest and most modern type of Draeger helmets and rescue apparatus.

Employees of the Sterrick Creek Colliery of the Temple Coal & Iron Co. in Jessup, are on strike because the engineers employed in and about the operation have refused to join the miners' union. Strikes of this kind are not sanctioned by the union, and the strikers do not receive union support. The agreement under which the miners are working provides that no men be forced into the union, and it provides also that all grievances between the employees and operators be adjusted by a colliery grievance committee and the colliery officials. In the event of such a conference failing to bring about an adjustment, the grievances, under the contract, go to the conciliation board for settlement.

Bituminous

Courtney—Ninety-six bodies have been taken from the Cincinnati mine of the Monongahela River Consolidated Coal & Coke Co., which was wrecked by an explosion Apr. 23. All but two have been identified. Officials of the company will make no statement. The work of cleaning up the mine and putting it in condition for reopening is progressing rapidly.

Punxsutawney—The powder house of the Rochester & Pittsburgh Coal & Iron Co., at Lucerne, narrowly escaped destruction recently as the result of a forest fire. The flames worked up within a few hundred yards of the building and it was only with the united efforts of the farmers and a few volunteers that it was saved.

Somerset—The store and a part of the tippie of the Bando Coal Co., three miles south of Somerset, were destroyed by fire recently. It is thought that the fire was caused by sparks from a passing B. & O. locomotive. The Bando mines have been idle for a year and the store building was empty. The loss is estimated at from \$1800 to \$2000 and is partly covered by insurance.

OHIO

Ulrichsville—The fan house at the Hiawatha Coal Co.'s mine near "52" cut, has been completely destroyed by fire. The origin is not known. The building was a frame structure, 24x14 ft., and contained valuable machinery. The mines had just resumed operations under a receiver after an idleness since Feb. 22. Forty men are out of employment. There was no insurance.

Columbus—John B. Moore, president of the United Mine Workers of the Ohio district, and Duncan McDonald, of Springfield, Ill., have been selected to represent the miners of the United States at the International congress at Karlsbad, Bohemia, July 21 to 24. The congress will be presided over by Robert Smillie, the British president.

Coal operators and jobbers throughout Ohio are very much interested in the coming appointments of Governor Cox on the commission authorized by the Ohio General Assembly to investigate the rate of payment for coal mining in the state. The authorization is contained in the Thomas resolution adopted by both houses of the legislature and was intended to forestall action on the Green antiscreen bill. While the governor has not given any intimation of the men who are to constitute the commission, he has publicly announced that that body is to have its report ready for consideration by the extraordinary session of the general assembly to be convened during the coming winter.

St. Clairsville—Two thousand five hundred miners in the various mines of the Lorain Coal & Dock Co. in Belmont County struck recently because of the refusal of the company to pay the men extra for work in cutting soapstone and slate out of the mines.

Bridgeport—Two thousand miners who went on strike May 1, still refuse to return to work. It is reported that delegations representing the men will try to induce the miners throughout eastern Ohio to enlist. The strike was caused by the refusal of the various coal companies to pay the men for roll cutting, or the removal of slate from the mine.

Logan—Work in the mines about Nelsonville and New Straitsville, is picking up rapidly. Orders from the lake ports are stimulating the shipments. The local freight crews are working full capacity to take care of the trains going north on the Hocking Valley. Pomeroy and the southern mines are not working yet. A large number of them are badly damaged by the flood.

INDIANA

Indianapolis—Indiana coal operators are not excited by the proposed abolishment, at Washington, of the tariff on coal. The state is too far inland to be more than indirectly affected. Coal men see the possibility that Welsh coal might interfere with the coast trade, say, in Pocahontas and any abbreviation in the amount of the Virginia product that goes to steamships and other consumers east might throw a

larger amount into Indiana and cut down to that extent the consumption of Indiana domestic.

Indiana domestic has not been cutting a large figure, however, even though efforts have been made to make consumers better acquainted with this Indiana coal. When natural gas failed in Indiana, a board of coal dealers was created who did not know one grade of coal from another. There were operators who took advantage of this ignorance to market some inferior so called Indiana domestic coal. The result was that this low grade of fuel has given Indiana coal a blow from which it has been difficult to recover. Notwithstanding the really good domestic grades are being worked into consumers' bins again.

The executive board of the U. M. W. A. has passed a resolution endorsing the action of Senator John W. Kern, of Indiana, in trying to get a committee appointed to conduct a federal investigation into conditions in the Cabin Creek and Paint Creek fields. A copy of the resolution was mailed to all the U. S. Senators.

ILLINOIS

Royalton—The strike at the two Royalton mines still continues. It seems to be a case of where the miners insist that the new company, which bought the property of the South Mine after it had gone through the bankruptcy act, pay the miners for the labors performed under the former owners. The present operators are in no way connected with the former owners of the mine, and for that reason contend that the miners should not look to them for their wages, but should have secured same while the property was in the hands of the bankruptcy court. The miners contend differently, and won't work until they get their back wages.

KENTUCKY

Earlington—It is reported that organizers representing the United Mine Workers of America have been at work in this vicinity for some time, in an effort to unionize the mines in this section. It is asserted by some of the interested operators that the movement is due to the influence of Indiana operators, who complain because of the fact that western Kentucky mines can undersell them.

PERSONALS

W. F. Murray has been appointed assistant general superintendent of all the Colorado mines of the Victor-American Fuel Co.

Col. J. C. Maben, of New York, president of the Sloss-Sheffield Steel & Iron Co., is spending several days in Birmingham, Ala., inspecting the properties of his company in that district.

P. F. O'Neill has been appointed assistant general counsel for the Lehigh Valley Coal Co., and will have full charge of the legal affairs of Cox Bros. & Co., Inc., operating in the Hazleton region.

R. E. Howe, former traffic manager of the Knoxville, Sevierville & Eastern Ry., has accepted a position as secretary of the Climax Coal Co., at Middleboro, Ky. Mr. Howe has been succeeded by J. M. Starrett.

P. J. Rogers, superintendent of the Tennessee Coal, Iron & R.R. Co., has been selected by Governor O'Neal, of Alabama, as the third member of a commission which will soon inspect the scales at the Banner mine.

Thomas Smith, formerly superintendent of the Consolidation Coal Co.'s mines at Two Lick and West Fork, has been transferred to Montana where he succeeds Harley W. Smith, who has asked for a leave of absence on account of illness in his family.

J. Albert Cook, who for a number of years has been a member of the engineering department of the West Virginia division of the Consolidation Coal Co., has become superintendent and has been assigned to the mines at Beechwood and Murray to succeed W. H. Hess, who has been transferred to the mine at Gipsy. Mr. Hess takes the place of A. V. Morgan, who has resigned from the service.

Thomas H. Hayden, for a number of years operating superintendent of the Kentucky & Indiana Terminal R.R. Co., at Louisville, who resigned that position recently, has been appointed general manager of the Cumberland R.R., in southeastern Kentucky, with general charge of the extensive coal holdings of the company, which has five mines in active operation at this time. Mr. Hayden's experience has been entirely with railroads, having been actively engaged in almost every line of service in that connection since 1876. In his new position he succeeds E. C. Milliner, who resigned to look after private interests.

CONSTRUCTION NEWS

Natrona, Penn.—Important contracts were let at Kelly Station Saturday when officials of the Providence Coal & Coke Co. met at that company's plant. Estimates approximating \$25,000 were made on a new tippie.

McDonald, Penn.—It is reported that the Peoples' Natural Gas Co. is drilling a well in this vicinity, which is already the deepest in the world. The present depth of the well is said to be over 6200 ft. and there are more than 60 tons of pipe in the hole.

Pottsville, Penn.—The extent of the Locust Mountain Coal Co.'s operations is illustrated by the recent increase in the amount of capital to \$550,000. Pres. Baird Snyder states that the work of boring the tunnel through the rock and the erection of the breaker will be pushed.

Birmingham, England—A new colliery has been opened up at Birmingham and is fitted with every modern appliance to operate a coal seam 24 to 28 ft. in thickness. It is calculated that with a force of from 500 to 600 men the output will be from 300,000 to 350,000 long tons per annum.

Pittsburg, Kan.—The Central Coal & Coke Co. has started sinking a shaft one-mile northwest of Edison. The top house at the mine is nearly completed. When the mine opens it will be one of the largest in the district and will employ from 200 to 300 men. It will be known as mine No. 48.

Bluefield, W. Va.—R. W. Stone, who has recently accepted the position of superintendent of construction for the Pond Creek Coal Co., states that the company is preparing to erect about 400 homes at the various operations along the new line. Several large stores will also be built. The work is to begin at an early date.

Prairie du Chien, Wis.—The Roberts & Schaefer Co. of Chicago have been awarded the contract for a large coaling plant for the Chicago, Burlington & Quincy R.R. to be built here immediately. The same firm recently secured a contract from the Chicago & North Western Ry. for the construction of a Holman locomotive coaling plant to be erected at Green Bay, Wis.

Whitesburg, Ky.—It is reported that the work of ballasting the upper extension of the Lexington & Eastern is being rushed to completion, and two months more is expected to see the work finished. This part of the road connects Hazard and McRoberts, and will bear an important part in the freight and passenger traffic when completed. It is now handling trains, but when fully ballasted can accommodate more and heavier traffic.

Bluefield, W. Va.—The U. S. Coal & Coke Co. has conditionally awarded contracts to Rufus J. Bird & Co. for the building of 125 company houses for the concern's operations at Nos. 3 to 11, inclusive. The total cost will be approximately \$130,000. A contract, involving the sum of \$120,000, has also been awarded to John Doss, of Welch, W. Va. It is the intention of the company to make the appropriation and start the construction work by May 15.

Pottsville, Penn.—Large steam shovels have been shipped to Locust Mountain and it is expected that operations will soon be started to take off the entire top of the mountain to get at the coal. The seams near the surface will be stripped in time to take out the coal to operate the new breaker, now in the course of construction. Pending the construction of an extensive system of tunneling, the coal will be carried from the distant points of the strippings by a tramway.

Beaver Creek, Ky.—The construction of the new Beaver Creek branch of the Chesapeake & Ohio Ry., from the mouth of Beaver Creek to Steele's Creek, a distance of twenty miles, has recently been started, a large force of men and teams being actively engaged in the work. It is expected that the road will be completed within a year, and it is assured of heavy traffic from the start, in view of the richness of the coal and timber lands which it will open up.

Huntington, W. Va.—The Chesapeake & Ohio is opening up a vast territory rich in coal and oil in the Beaver Creek district in Kentucky. Several operations are to start there within the next four months and the railroad officials expect to handle a big output of coal. Contracts for the work of building a line to Beaver Creek from the main line have already been let. Twenty-one miles of track are now being laid, but it may be decided to extend the line later on. The spur connects with the main line of the road near Allen, Ky.

Seranton, Penn.—Contractors have broken ground for a model village that is to be built around the Underwood colliery of the Pennsylvania Coal Co. The village is to consist of 28 double houses, of timber construction, 28x40 ft. Several frame buildings are also being built for the colliery bosses and their families. The Underwood colliery is to be one of the most modern in this part of the state. It will open up large tracts of hitherto untouched coal and will give employment to a large number of men for many years. It is expected that the colliery will be ready for operation within a few weeks. Hower & Stender are in charge of the construction work.

NEW INCORPORATIONS

Pittsburgh, Penn.—The Bruin Coal Co.; capital stock, \$10,000. Incorporators: A. M. Thompson, J. H. Thompson and Ray Rose.

Rock Island, Ill.—The City Coal Co.; capital stock, \$5000; to deal in fuel. Incorporators: W. J. Lacey, W. F. Zibell and A. R. Gates.

Rock Island, Ill.—The Spoon River Coal Co.; capital stock, \$6000; to mine coal. Incorporators: W. A. Schaeffer, C. A. Schoessel and W. D. Godfrey.

Sparta, Tenn.—The Young Coal & Coke Co.; to develop and operate a coal mine at Obey City. Incorporators: E. C. Young, W. B. Goodwin and John McDaid.

Nashville, Tenn.—The Old Virginia Coal Co.; capital stock, \$25,000. Incorporators: W. F. Hutcheson, H. B. Bonney, J. R. Barnes, W. W. V. Mullan and W. B. Miller.

Sharpsville, Penn.—The Pierce Coal Co.; capital stock, \$150,000; chief works in Parton County, Mo., and offices at Sharpsville. Incorporators: A. M. Imbrie, Frank Pierce, M. L. Pierce, T. A. Pierce and A. C. Andrews.

Columbus, Ohio—The Chaparral Mining Co. has been incorporated with a capital stock of \$125,000 to mine and deal in coal. The incorporators are P. L. Tanzey, E. C. Paine, W. G. Bossman, C. H. Blackee and R. S. Barbee.

Dover, Del.—A certificate of increase of capital stock of the American Coal & Byproducts Coke Co. was filed at the State Department Apr. 30. The increase is from \$500,000 to \$5,000,000. The company was chartered in 1912.

Salem, Ohio—The Salem Mining Co. has been incorporated with a capital stock of \$75,000 to mine and deal in coal and clay. The incorporators are Charles Estep, John E. Reese, J. E. Morgret, W. W. Weaver and R. D. Anderson.

Knoxville, Tenn.—The Vaspar Coal Mining Co.; capital stock, \$100,000. Incorporators: G. C. Bell, E. Carson, E. C. Stookesberry, W. J. Donaldson and Robert Young. The property of the company is located at Vaspar, in Campbell County.

INDUSTRIAL NEWS

Cincinnati, Ohio—Judge A. M. J. Cochran has confirmed the sale of the Covington Coal & Sand Co. The purchaser was Theodore Kirk.

Chicago, Ill.—The Dominion Coal Co., Ltd., has given notice that \$110,000 of its first mortgage 5 per cent. bonds were to be retired May 1 at 105 and interest.

Bridgeport, Tex.—Recent rains have visibly increased the city's industrial activity. The coal mines are running on full time and the working forces will be increased.

Dresden, Ohio—A recent shipment of coal to Dresden has enabled the water-works plant to resume operations. The electric lights, however, have not yet been placed in operation.

Knoxville, Iowa—Coal prospectors are now working in a newly discovered field in this vicinity. According to reports received the drillers have struck at least four workable seams of coal.

Birmingham, Ala.—At a coming meeting of the directors of the Alabama Co., formerly the Alabama Consolidated Coal & Iron Co., permanent officers will be elected. The meeting will be held in Baltimore.

Duluth, Minn.—It is estimated that over 150,000 tons of coal have reached the harbor at Duluth since the first boat arrived a little over a week ago. This has been principally in the nut and stove sizes.

Rock Island, Ill.—A theoretical merger of the Union Ice & Coal Co., the Spoon River Coal Co. and the Spoon River Colliery Co. has been effected through the efforts of Willard A. Schaeffer, president and general manager of the latter concern.

Pittsburgh, Penn.—The Pittsburgh Coal Co. has leased a strip of land from the estates of Alexander and Thomas Jones. The tract of land in question lies along the Monongahela River wharf and extends for 500 ft. above the Point bridge.

Birmingham, Ala.—A meeting of prominent Alabama citizens was held in the Morris Hotel, Birmingham, for the purpose of discussing the advisability of taking convicts out of the Alabama mines and away from the control of private corporations.

Connellsville, Penn.—The Marion plant of the Southern Connellsville Coke Co., near Cheat Haven, has been forced to bank its ovens for a week, owing to the installation of a cable across the river. Until now the plant has been making full time.

Rural, Penn.—Five diamond drills are busy testing 18,000 acres of coal lands located in Indiana County, near the Cambria County line, the holdings of the Greenwich Coal Co. It is understood that the Manor Real Estate Co., of Philadelphia, will acquire the property and commence coal operations on a large scale.

Washington, Ind.—The Riverside Coal Co.'s mine has been sold at a receiver's sale to W. B. Catching, of London, Ky. The consideration was \$4000. This same property was recently appraised at \$15,000. It is said that the mine will resume operations.

Johnstown, Penn.—Engineers employed by the Cambria County commissioners have just finished the task of assessing the minerals of the county at what they believe to be the full value. The coal in Cambria County is said to be valued at \$25,000,000.

Denver, Colo.—The Colorado Fuel & Iron Co. has rendered 3400 acres of coal land, valued at \$1,000,000, to the United States government in consideration of the dismissal of a suit involving 5800 acres owned by the company. The land is located in southern Colorado.

Louisville, Ky.—It has been learned that J. C. C. Mayo, vice-president of the Elkhorn Fuel Co., has received, in consideration for the transfer of certain of his coal lands to the new corporation, \$600,000 in cash, \$2,000,000 in preferred stock and \$2,000,000 in common stock.

Columbus, Ohio—Reports received by Columbus operators state that practically all vessels on the lake were expected to be in commission by Apr. 30. Crippled conditions of the railroads and shortage of available cars is making the movement of coal from the mines to the lake slow.

Shelburn, Ind.—The Klondyke mine, southwest of Shelburn, has been closed for some time because of burning gas in the mine. Operations will be resumed, however, as soon as the aircourses have been opened up. The work required to do this will cost in the neighborhood of \$500.

Cincinnati, Ohio—On Apr. 28 the Queen & Crescent R.R. started operations with its new \$15,000, 500-ton capacity coal chute at Ludlow. This is the first to be completed of the \$150,000 improvements, which were authorized last Fall. The other improvements include a roundhouse and yard facilities.

Terre Haute, Ind.—Chauncey M. Weeks, a farmer in Prairie Creek township, has given a two-year option to Richards & Sons, coal operators. The tract consists of 92 acres and the option price is \$35 an acre. The company may use five acres for buildings, railroad lines and switches; \$150 an acre to be paid for the site.

Charleston, W. Va.—Clark & Krebs, civil and mining engineers of Charleston, W. Va., have recently completed a map showing the property lines, location and car allotment of the mines in the New River, Kanawha River, Coal River and Guyan River coalfields, in West Virginia. This map will be of great use for reference.

Chicago, Ill.—Officials of the Consumer's Co., which is a consolidation of the City Fuel Co. and the Knickerbocker Ice Co., report that they will soon be ready to prepare a statement of the company's financial position. This will be submitted with the applications to list the shares on the Chicago and New York stock exchanges.

Chattanooga, Tenn.—Chattanooga capitalists have recently purchased the Monarch coal mines at St. Charles, Va. Application has been made for a charter for the new company, changing the name to the Old Virginia Coal Co. The original capital stock is set at \$25,000. This will probably be increased after the concern has begun operations.

New Orleans, La.—A New Orleans company has built steel barges, bought tugboats and established a depot for handling large quantities of Alabama coal for export and to supply ships' bunkers. The company will take advantage of the completion of the government locks on the Warrior and Tombigbee Rivers to barge coal past Mobile and into New Orleans.

Little Rock, Ark.—The coal tests which have been recently conducted by the Rock Island road to determine the efficiency of several grades of coal have been concluded. It is expected that a decision will be reached soon as to the grade of coal to be used on the Rock Island. Samples of Arkansas, Oklahoma and other grades of soft coal were used in these tests.

Salt Lake City, Utah—The Jesse Knight interests in Carbon County are operating a coal property located on the Denver & Rio Grande R.R. at the new town of Storrs. The machinery is up to date, and the company plans to furnish a quality of coal which is unsurpassed by any in that locality. The coal is mined from beds averaging 8 ft. in thickness, over which is 1000 ft. of solid sandstone capping. The capacity will be from 1500 to 2000 tons per day.

Brownsville, Penn.—Bids have been received for the driving of the slope entrance at the new plant of the Lilly Coal & Coke Co. This work will be hurried as much as possible. The tippie has been under construction for some time. Some alterations were made, however, due to the change of the P. V. & C. tracks in the vicinity of the new plant. It is the intention of the officials to operate the plant at the earliest possible moment. Thomas Elliott is general manager.

Pittsburgh, Penn.—A deal involving 223 acres of coal land in Allegheny Township has recently been consummated by J. F. Steele, executor of the Miriam S. Steele estate. The Lucsko Coal Co. bought the tract for a consideration of \$28,500, a little more than \$125 an acre. The coal is the upper and lower Freeport and Kittanning seams. The especial value of this piece of land lies in the fact that it is the key to many acres of coal behind it which cannot well be operated without the Steele holdings.

Du Bois, Penn.—Options which were recently taken on 6000 acres of coal land in Green Township by E. E. Davis, of Johnstown, were ordered lifted May 1. The land owners were notified that payment would be made within a few days. Between \$50 and \$70 an acre was paid for the land, and the entire deal means a transfer of about \$360,000. The tract is mixed up with a field of about 15,000 acres owned by the Greenwich Coal & Coke Co., and it is the general opinion that this company is the purchaser. The field is already tapped by the Cherrytree & Dixonville R.R., which is jointly owned by the New York Central and the Pennsylvania.

Louisville, Ky.—Three Louisville coal concerns, handling Pittsburgh coal from the mines of the consolidated interests, have been combined under one management, to be known hereafter simply as the Pittsburgh Coal Co. The companies included are the O'Neil Coal & Coke Co., Joseph Walton & Co., and O'Donnell & Co. The consolidation was announced to take effect May 1. The new company is to be managed by Charles J. O'Conner, formerly president of the O'Neil Coal & Coke Co., who will be assisted by W. S. Montz, formerly of Joseph Walton & Co. Rumors of such a move have been current for some time, but it was not definitely decided upon until very recently.

Fossil, Ore.—Property owners and business men of Fossil, have organized for the purpose of developing the coal fields in this vicinity and in connection therewith the building of a railroad from Condon to Fossil and the coal deposits, about ten miles from the town. The project is headed by Joseph J. Henry, of Chicago, Anthony Mohr and J. E. Reed, of Portland, and Dr. A. Ives, of Chicago. A meeting was held this week in Fossil and committees were appointed to solicit the necessary funds for preliminary work. Vice-president J. P. O'Brien of the O.-W. R. & N. Company, which operates a branch line to Condon, has been interviewed in regard to the extension of this line from Condon to Fossil, and it is said this will be done providing evidence can be shown that the mine will have a daily output of at least 300 tons from the start. In view of the encouraging preliminary reports, it is regarded as certain that the railroad will be built as soon as the proper arrangements can be completed.

COAL TRADE REVIEWS

GENERAL REVIEW

The regular monthly advance in prices on the domestic grades of hard coal has not caused any decrease in the demand, which continues as insistent as ever. Mines are working up to full capacity and the only difficulty before the operators is providing an equitable distribution of the production. In previous years at this time, the companies have usually had substantial surpluses on hand with which to meet the excessive demand, but, owing to the restricted production last year, such is not the case now and the freshly mined product has to be relied upon entirely. The loading at the New York piers for the coastwise trade is slow, and consumers are finding it difficult to obtain their required tonnages, especially when they are particular about sizes.

Now that the West Virginia labor situation has been partially cleared up for the moment at least, consumers are waiting for some response in the market before undertaking any extensive buying. The indications are that they are not without justification in their position as it is difficult to see how the new high prices at Hampton Roads can hold unless a rigid restriction is put upon the production. There is a free movement on contract in the coastwise bituminous trade, consumers taking their full allotment, and there are indications of some improvement in prices, particularly on certain grades which are developing unusual strength.

The Pittsburgh market is becoming more and more active, due to the exceedingly heavy demand in the Lake trade stocks are low at the head of the Lakes, and jobbers at that point are anxious to lay in the maximum supplies because of the possibility of labor troubles when the agreements expire next April before navigation is again open. The labor unrest, so general throughout the country, seems to indicate that there may be serious trouble between the operators and miners before the next agreement is reached. It is difficult for consumers to obtain coal at the regular Pittsburgh circular now, a contract for a million tons having been recently refused. Bituminous and anthracite operators are showing a determination to put enough coal beyond Lake Michigan to supply any reasonable demand. Both Lake and steam business in Ohio has been heavy, and the general tone is good.

There have been heavy shipments in both the foreign and coastwise trade out of Hampton Roads, but the congestion at the piers continues unrelieved; producers are showing every indication of holding firm on prices, while buyers are slow about closing, evidently believing that a sharp decline is inevitable. In the Southern pig-iron market the depression is being more keenly felt and the effects are now spreading to the coal industry; steam coals are as yet the only sufferers, but some new low prices have been touched by these.

Mines in the Middle West are working about normal, and the domestic demand is light; some summer retail prices are going into effect. Domestic consumption is much curtailed and there is a tendency on the part of dealers to reduce stocks. Contracting is more active. The customary freight discounts in the Rocky Mountain region were not made this year, and shipments are confined entirely to the current demand, with the result that operations will be somewhat restricted.

BOSTON, MASS.

Bituminous—With any possibility of serious trouble in the New River field now pretty generally minimized, buyers will wait for the market to steady up before making any comprehensive purchases. There is a good deal of opinion here that the \$2.85 price on Pocahontas and New River f.o.b. Hampton Roads will be too high for summer deliveries, and that in the absence of a drastic curtailment, figures will have to be modified in order to move coal. On the other hand prices on Georges Creek and on the better Pennsylvania coals are firm in response to an improved demand. This is especially true of certain of the Cambria and Clearfield grades and quotations are from 5@10c. higher than prevailed during April. Improvement also continues in the all-rail territory and most of the shippers report a comfortable volume of business in hand.

For inland delivery, prices in general are about 15c. up from last year but orders that are competitive are also slow in being closed. Rail coals of good quality are making in-

roads on tonnage that is ordinarily reserved to tidewater grades. A large volume of Georges Creek is finding a ready market here. The shippers have ample business in hand and 1913 bids fair to be a record year for this popular grade. A large fleet of steamers and barges, the latter suitable for medium draft points, has an important bearing on the large tonnage placed in New England every year.

Water freights are easy at 70@75c. for large vessels, Hampton Roads to Boston, with only a moderate inquiry. The bulk of the bituminous tonnage is brought in steamers, almost all chartered on government form rather than at a rate per ton, and that has its effects on the freight market. The steamers "Kennebec" and "Kanawha" for some years in the coastwise coal trade are understood to have been sold for the lumber trade.

Anthracite—Another sign of the strong demand for hard coal appears in a disposition on the part of the companies to restrict the proportion of stove size in any one cargo. The slow loading at some of the New York piers is already causing anxiety to some of the New England dealers. Many of the latter are surprised to find that hard coal is just at this present moment rather hard to get, especially if they are fussy about the proportion of sizes.

Current bituminous quotations at wholesale are about as follows:

	Clearfields	Cambria Somersets	Georges Creek	Pocahontas New River
Mines*	\$1.00@1.35	\$1.25@1.45	\$1.67@1.77	
Philadelphia*	2.25@2.60	2.50@2.70	2.92@3.02	
New York*	2.55@2.90	2.80@3.00	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				\$2.75@2.85
Providence†				3.73@3.78
Boston†				3.73@3.90

*F.o.b. †On cars.

NEW YORK

Anthracite—The strong and insistent demand for hard-coal continues unabated, with no indications in sight of any immediate letup. In the steam grades, buckwheat and barley are still the easiest sizes, while rice continues as short as ever. In the domestic fuels, stove, of course, still continues to lead in demand, with egg second and also very short in supply. As a matter of fact, nearly all sizes are in heavy demand, and it is simply a question with the companies of getting a maximum production and making an equitable distribution of same.

There is some uncertainty as to the amount of surplus coal in stock at the present time. Ordinarily, at this season of the year, the companies have some surplus stocks to draw upon, but such is not the case now because of the shortage in production last year. On the other hand, the exceptionally mild winter resulted in a materially reduced consumption so that, in all probability, many consumers carried over unusually large surpluses.

We quote the New York market on the following basis:

	Circular	Individual— Lehigh	Seranton
Broken.....	\$4.60	\$4.45	\$4.60
Egg.....	4.85	4.70	4.85
Stove.....	4.85	4.70	4.85
Chestnut.....	5.10	4.95	5.10
Pea.....	3.50	3.35@3.45	3.10@3.20
Buckwheat.....	2.75	2.25@2.45	2.50@2.75
Rice.....	2.25	1.90@2.00	2.25@2.35
Barley.....	1.75	1.45@1.70	1.60@1.75

Bituminous—With the exception of the all-rail business, there is a noticeably better tone in the local trade. There are persistent inquiries for odd tonnages in the spot market and unexpectedly good figures are being obtained in some instances. The orders are from local brokers who are very probably acting for large producers that are falling behind on their contracts and also for water shipments into the New England trade. These conditions indicate an improved tone that is gratifying to the operators and makes the outlook for the future decidedly better.

The improved tone is naturally reflected in quotations, although the market is not quotably changed from the prices that have been prevailing over the last month and a half, or two months. Quotations are being more firmly held, however, the off qualities becoming somewhat tighter and the good grades noticeably short. We continue last week's quo-

tations as follows: West Virginia steam, \$2.55@2.60; fair grades, Pennsylvania, \$2.65@2.70; good grades of Pennsylvanias, \$2.75@2.80; best Miller, Pennsylvania, \$3.05@3.15; Georges Creek, \$3.25@3.30.

PHILADELPHIA, PENN.

The first week of the ten-cent increase in anthracite over April figures has passed, and the trade apparently has renewed all the unfilled orders of the previous month, as the companies still continue operating their mines to the fullest capacity and outside of some of the steam coals, there is little or none of the output going into stock. Retail dealers report that trade is fairly good, although not as strong as it might be; the demand centering on the stove and chestnut sizes, with egg only fair. Pea coal is quiet, although some is moving into the cellars of the consumers; during the late spring and summer months this grade is not usually in particularly active demand.

Most domestic consumers of pea coal buy it from hand to mouth, and as the price does not usually vary from the basis established at the inception of the spring season, there is no particular advantage to the consumer in storing it; the stocks accumulated by the large companies finds a ready market during the winter. As a matter of fact, pea coal during the winter season is invariably short so that it is wise to provide against this call, when the demand is light.

The tidewater business continues to be heavy. Water transportation is able to find a ready market, and the current freight rates are quoted anywhere from 90c. to \$1 from this port. The output at the mines was not as great as April, 1911, due in a measure to the friction between the operators and miners, and while the loss in tonnage was small, compared with the aggregate, each suspension had its effect on the total.

In regard to the bituminous market, there seems to be a tendency towards increased business, at better prices. This improvement is more in the nature of stable quotations for the present offerings, rather than in any marked increase; the numerous fluctuations in prices that have characterized this branch of the trade for many weeks past have disappeared.

PITTSBURGH, PENN.

Bituminous—It is difficult to place new business with operators at the regular season prices, so many having withdrawn. Within the past few days the leading interest here turned down an offer of a million tons of lake coal at the regular figure of \$1.40. As noted last week operators controlling the major part of the production have advanced prices on all new business by 10c. and it is quite possible that the whole market may work up by this amount or even more. The demand from the Northwest is particularly heavy, both because of the short supplies at the close of last season and because of the general expectation that there will be a suspension of mining at the time of the next wage adjustment, Apr. 1, 1914, necessitating provision this season for a longer period than usual.

While it is customary to speak of the Pittsburgh district coal operators having the best season in many years, with the much higher prices ruling this year, attention should be directed to the fact that their financial results have as a rule been decidedly poor in recent years, and it is only by comparison that present results are good. The unrest among miners will undoubtedly crystallize into an unusually strong demand for advanced wages upon the expiration of the present scale. While plans are altogether inchoate at present it is well understood that this will be met by a specific demand for a reduction and a contest of no mean proportions is promised.

We quote prices at a range on some descriptions, the higher figures representing the advance asked by many operators on new business: Slack, 90c.; nut and slack, \$1.05; nut, \$1.25; mine-run, \$1.30@1.40; ¾-in., \$1.55@1.65, per ton at mine, Pittsburgh district.

Connellsville Coke—Demand for prompt furnace coke continues very light, and no interest is shown in contract coke. Furnaces are well supplied by contracts, against which full deliveries are being made, and those which must purchase for second half are biding their time, awaiting a more settled pig iron market, and seeing no occasion to ask quotations when the nominal asking price on contract is 25 to 50c. higher than prices ruling for spot. Operators generally ask \$2.25 on prompt furnace coke, but odd lots are picked up without much difficulty at \$2.10 to \$2.20, and \$2 can probably be done sometimes. On contracts \$2.50 is asked but buyers do not take the figure seriously. Foundry coke is somewhat easier. We quote: Prompt furnace, \$2@2.25; contract furnace (nominal) \$2.25@2.50; prompt foundry, \$3@3.25; contract foundry, \$3@3.25 per ton at ovens.

BUFFALO, N. Y.

The bituminous market is very steady and becoming more so every week. There is a decided scarcity developing, due to a shortage of miners and to an indifferent car supply that appears steadily worse. Members of the trade are saying that they would not know which way to turn if the demand should suddenly increase. There are operators in this market who have been putting out all the coal they could for sometime and now they are not keeping up well on their contracts. There is no surplus coal whatever on track and if a jobber runs short of a certain variety he often finds it hard to buy in the open market.

The coal shortage is due to most of the mines in the Pittsburgh district declining to accept further orders from new customers at present. The Pittsburgh district used to furnish more than one-third the coal in this market, so that the mines in the Allegheny Valley had to depend on their advantage of 15c. in freight to sell their output but it is quite different now as the latter coal often has to take the leading part. The lake trade, of course, has much to do with the present situation, but it must be remembered that it was found impossible last season to satisfy the lake demand and it may turn out so again. Shippers both bituminous and anthracite are showing a determination to put coal enough beyond Lake Michigan this season to meet the demand there, for the rail lines are not able to make up much of a shortage that may exist when the lakes close.

Bituminous prices are firm at \$2.80 for Pittsburgh lump, \$2.65 for three-quarter, \$2.55 for mine-run and \$2.15 for slack. Coke continues quiet at former prices, on the basis of \$5 for best Connellsville foundry. Coal now sells so readily that it is quite possible for operators to prefer that market and let coke wait till it is stronger.

The Anthracite Trade is quiet. Shippers say there is a decided hesitancy on the part of jobbers and consumers, which is quite easily explained by letters from certain dealers, declaring that their purchases are all on hand and they cannot pay their bills, all of which means that the consumers are also overstocked. Lake shipments for April foot up 505,000 tons.

BALTIMORE, MD.

There has been a slight improvement in the local spot market due apparently to some rather heavy requisitions from the large canning factories, which are making preparations to resume operations within the next few weeks. There are a great many of these plants in this vicinity, and most of them buy their supplies in the spot market. Those who do contract have not yet signed up.

Because of this improved demand quotations are somewhat firmer especially on the better grades which are in the shortest supply. The situation on the off qualities has not experienced any noticeable change. There is a free movement under contract, consumers mostly taking their maximum requirements. The labor shortage in the West Virginia fields is becoming more pronounced each week and the outlook for the future is regarded by many as rather unfavorable. This will be particularly true should the Federal Government start investigating the situation as now seems probable.

The car supply is adequate and meeting the full requirements at the moment but some believe that conditions in this respect do not look favorable for the future. The production of coke is still curtailed because of the light demand, and there are reports from the trade that prices are weak.

COLUMBUS, OHIO

Activity in the coal trade in Ohio during the past week was divided between the lake business and the steam trade. Both classes showed up well and as a result the tone of the market is very good. Operators and shippers are looking forward to a good season in both lines and preparations are being made for a heavy production.

The lake trade is opening extremely active in every respect. Chartering of vessels is going on rapidly and the movement is quite large. Since there is a good demand from the Northwest it is believed the present season will exceed that of 1912. Prices f.o.b. vessels are 10c. higher than last year, or at the same level which prevailed in 1911. The ore trade is opening actively and this means a better movement of coal.

Steam trade is strong in every way. The demand from manufacturing establishments is increasing since most of the factories put out of commission by the flood have resumed operations. Accumulated orders has made it necessary for these factories to buy a larger tonnage of steam coal. The demand from railroads is also increasing as the freight movement is larger. Contracts which have expired recently are being renewed at higher figures than prevailed in 1912.

Considerable attention is being given to railroad contracts which will be placed soon. The one weak spot in the market is the fine coal, which is usual when the lake season is booming; but the weakness is not as marked as in former years. All other grades are holding up strong.

Some little demand is reported for domestic grades, but not sufficient to cause much stir. Most of the orders are traceable to the effects of the high waters of a month ago. Dealers, however, are preparing for the stocking season which is expected to be slightly earlier than usual.

The output in Ohio fields during the week has been good. Since the railroads are better able to handle coal, eastern Ohio and the Hocking Valley has been producing about 75 to 80 per cent. of normal. The output in the Pomeroy Bend district is not quite so large because the flood damages in that field was heavier. In the domestic fields the output is not large.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump.....	\$1.50	.....	\$1.50	\$1.50
4-inch.....	1.35	\$1.20	1.35	1.30
Nut.....	1.25	.....	1.25	.....
Mine-run.....	1.15	1.10	1.15	1.10
Nut, pea and slack.....	0.70	.....	0.90	0.80
Coarse slack.....	0.60	0.75	0.80	0.70

HAMPTON ROADS, VA.

The last week has brought about little change in the coal situation at Hampton Roads. While there have been some large shipments both coastwise and foreign they have not relieved the accumulation at the several piers and the railway yards are still in a badly congested condition. However, producers are not cutting prices, while buyers are holding off evidently expecting a decline, and there were few sales made during the past week.

The enormous total of more than one million tons of coal was dumped over the three Hampton Roads piers during the month of April, the exact figures being 1,054,208 tons. Of this quantity the Norfolk & Western Ry. handled at Lamberts Point 508,158, the Virginian Railway at Sewalls Point 249,225 tons and the Chesapeake & Ohio at Newport News 296,825. Work on the steel pier at Newport News which has been badly delayed is now being pushed forward as rapidly as possible day and night.

LOUISVILLE, KY.

The local situation has not changed to any material extent during the week, the domestic grades still continuing in light demand with the steam coals rather tight, although also showing a tendency to become easier. The car supply is adequate at the moment, but may become shorter with the result that operators are becoming cautious over future commitments both for this reason and because higher prices are anticipated in the near future. The improvement in the price situation will be brought about by the increased demand from the Northwest; the West Virginia producers are finding themselves less able to meet the rapidly increasing requisition from there and the result is that much of this business is being diverted into the Kentucky field in spite of the fact that the latter is under some disadvantage in freight rates. The West Virginia operators are also more handicapped as a result of the recent flood than is the case with the local producers. There is a strong demand for the Southern coals in the Northwestern market.

Prices continue around the summer level with the exception of the steam grades which as already noted, are in strong demand. The eastern Kentucky block is plentiful at \$1.45 to \$1.50 f.o.b. mine with lump and block at \$1.25, mine-run \$1.05 to \$1.15, No. 2 at 85 to 95c., and domestic nut at \$1.25 to \$1.35. Nut and slack are firm at 85 to 95c. and western Kentucky screenings, nut and slack are quoted from 75 to 85 cents.

BIRMINGHAM, ALA.

There is little encouragement to be found in the general situation in this district, the depression being more keenly felt in the pig-iron and steel markets and the coal trade has not by any means escaped. Steam coal has suffered most and low record prices for the season have been made on what might be termed second-grade product. The lump and nut situation, while better than steam, is not showing any activity worthy of mention. The real cause of the apathy in business is somewhat difficult to place and many varied reasons are advanced as the source of the trouble.

In contrast to other markets, the foundry coke demand is very good and is showing no signs of weakness. There is little demand for furnace coke and the surplus supply is not large. Practically all of the pig iron smelting companies in this district have sufficient coke ovens for supplying their own requirements of furnace coke. The question of securing common labor is a weighty problem with many of the large industries.

DETROIT, MICH.

Bituminous—Slack coal is somewhat more active than the larger sizes and is the strongest feature in the local market at the present moment. Consumers are showing no anxiety about closing contracts to cover their future requirements, apparently believing that the settlement of the West Virginia labor situation will react to their advantage and result in a material reduction in quotations. Rail shipments are heavy and operators maintain an optimistic view of the situation and believe that they will have no trouble in obtaining the increased circular of the year. Local prices continue on approximately the following basis:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump.....	\$1.50	.....	.....	.....	.....	\$2.25	\$2.00
Egg.....	1.50	.....	\$1.35	.....	.....	2.25	2.00
1 1/2-in. lump.....	1.25	.....	.....	.....	.....	.....	.....
2-in. lump.....	1.20	\$1.20	\$1.20	\$1.20	\$1.20	.....	.....
Mine-run.....	1.10	1.10	1.10	1.10	1.10	1.50	.....
Slack.....	1.00	1.00	1.00	1.00	Open	Open	.....

Anthracite—The hard-coal market is showing none of the activity that was anticipated for this time. Consumers generally are refusing to place orders that could be advantageously filled both for themselves and the producers; they appear to believe that there is a recession of prices in sight and it is probable that the late fall will see the usual scramble for deliveries at the last moment.

INDIANAPOLIS, IND.

Mines in this state are averaging about four days a week which is normal for the season. The demand for domestic is at a minimum, but screenings are strong. Some time back a scarcity was reported but it is said that mines are now caring for all requisitions in a very satisfactory manner.

April will be memorable as the month of the great flood; railroad communication was badly demoralized and has not yet fully recovered. Many factories were damaged and the coal industry seriously interfered with, outside the flooding of some of the mines. But much coal was needed immediately following the subsidence of the waters and the volume of business for the month was thus kept up to about normal.

Prices at the mines for standard grades, f.o.b. are:

No. 4 mine-run.....	\$1.10@1.20	Domestic 4- and 5-in.....	\$1.50@1.60
No. 8 5 and 6.....	1.05@1.10	Screenings No. 4.....	0.90@1.00
Steam lump, 1 1/2-in.....	1.15@1.35	Screenings 5 and 6.....	0.80@0.90
Nut and egg.....	1.20@1.55	Brazil block.....	2.00@2.10
Domestic 3-in.....	1.40@1.65		

CHICAGO

As a result of an early spring, which has cut off the consumption of household coal, the domestic market is unusually quiet at the present time. There is a strong tendency to cut down storage piles and get rid of stocks as rapidly as possible.

Steam lump from Western mines is commanding prices ranging from \$1 to \$1.25, while mine-run coal is selling all the way from 95c. to \$1.10. Western screenings are selling at from 75c. to 85c. Prices for smokeless coal remain firm and it is expected there will be a rise in quotations on this commodity within a short time; according to some, mine-run will be advanced to \$1.50 and a still higher price for the prepared coal. There is a fair demand for coke in the spot market. A large number of contracts are now being made and the prices obtained vary. Contracting for coke among retailers and jobbers is especially heavy.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump.....	\$1.97@2.07	\$2.30@2.40	\$2.27	
Egg.....		2.30@2.40		\$3.65
Steam lump.....	\$1.82@1.87		2.07	
Mine-run.....	1.77	2.20@2.30	1.97	3.30
Screenings.....	1.57	1.95	1.57@1.62	

Coke—Connellsville and Wise County, \$6@6.25; byproduct, egg, stove and nut, \$4.45@4.75; gas house, \$4.60@4.70.

ST. LOUIS, MO.

Spring business is about normal in St. Louis with no demand for any size in particular. The policy of losing money on the operations still seems to continue. The lowest price quoted on Standard lump was touched the past week when it was offered at 80c. f.o.b. the mines. There are some contracts being signed up, but they do not, in a way, amount to much, and the prices are exceptionally low in view of the outlook.

Indications are that there will be a fair movement of anthracite during the present month. Coke is away off on demand but the price seems to be holding up. There is not much doing in smokeless, and it will perhaps lose in the spring tonnage this year on account of the aggressiveness of the anthracite shippers.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump.....				\$0.90
3-in. lump.....			\$1.20	
6-in. lump.....	\$1.15 @ 1.20		1.25	1.05
Lump and egg.....		\$2.25		
No. 1 nut.....	1.05 @ 1.15			
Screenings.....	0.90 @ 0.95			0.85
Mine-run.....	1.00 @ 1.10			0.80
No. 1 washed nut.....	1.35			
No. 2 washed nut.....	1.35			
No. 3 washed nut.....	1.35			
No. 4 washed nut.....	1.35			
No. 5 washed nut.....	1.10			

St. Louis prices on May anthracite are: Chestnut, \$7.05; stove and egg \$6.80; grate \$6.55. Smokeless lump and egg is \$4.45 and mine-run \$4. By product coke is \$5 and gas house \$4.75.

MINNEAPOLIS, ST. PAUL

While there is a prevailing quietness in all the branches of the coal trade at the present writing, enough business is going on to keep all in an optimistic mood. The Northwestern states are in a very prosperous condition, and although little coal is being moved, coalmen are looking at the present situation philosophically, knowing that the trade will buy when the time comes. There does not seem to be any disposition on the part of dealers in the country to stock hard coal even at the reduced spring price, which in May is 40c. lower than September.

Immediately upon opening of navigation the head-of-the-Lakes harbors became a scene of great activity and one of the busiest shipping seasons is now in progress.

OGDEN, UTAH

April started out very good and many of the operators predicted an excellent business but about the middle of the month the dealers began to anticipate a storage period, May 1, and the operators began inquiring of the railroads concerning a reduction in freight rates during May, June and July, but nothing definite could be learned. The dealer and the consumer, especially the former, anticipated some reduction on May 1, and held off buying during the last of April in order not to have high-priced coal on hand in case of a reduction. On Apr. 29 the railroads announced there would be no reduction in freight rates this year. This caused the operators to reduce the price of coal f.o.b. mines, and while circular quotations announcing the reduction were sent out to the trade immediately, it has not increased the movement.

The Utah mines are anticipating trouble ahead this winter. Their many inducements will no doubt cause the dealers to store Utah coal, in the latter part of the season, with the idea that they will be taken care of during the winter; however, all of the Utah mines are tributary to the Denver & Rio Grande R.R. and the car supply commencing about Sept. 1 will be about 25% of requirements.

Present quotations are as follows: Lump, \$2.25; nut, \$1.75; mine-run, \$1.75; slack, \$1; on both Wyoming and Utah grades.

PORTLAND, ORE.

Cool weather has set in again in this locality and coal for domestic purposes is in demand. However in a general way there is no material change in the situation and prices remain as during the winter.

Judging from the number of steamship lines that are to operate out of Portland upon the completion of the Panama canal there will be a strong demand here for bunker coal. Several foreign lines have announced that they will send steamers to this port from various ports of Europe, on regular route, and some of them are to make Portland their Pacific coast terminus. Two lines, the Hamburg-American and the Royal Mail, have already inaugurated sailings.

PRODUCTION AND TRANSPORTATION STATISTICS

SOUTHWESTERN TONNAGE

The following is a comparative statement of the southwestern tonnage for January, 1912 and 1913:

State	1912	1913	Increase	Decrease
Missouri.....	281,453	305,825	24,372	
Kansas.....	537,928	523,605		14,323
Arkansas.....	155,666	183,648	27,982	
Oklahoma.....	348,982	366,859	17,877	
Totals.....	1,324,029	1,379,937	70,231	14,323

ANTHRACITE SHIPMENTS

The following is comparative statement of the anthracite shipments for April and the first four months, of the years 1912-13, in long tons:

	April 1913	1912	4 Months 1913	1912
Phila. & Reading.....	1,180,115	31,324	4,579,408	3,893,690
Lehigh Valley.....	1,149,896	4,840	4,216,678	3,334,231
Cent. R.R. N. J.....	738,579	58	2,978,872	2,393,203
Del. Lack. & West.....	861,078	112,858	3,078,995	2,604,079
Del. & Hudson.....	561,700		2,344,688	1,718,283
Pennsylvania.....	585,472	49,687	2,082,297	1,653,515
Erie.....	672,386	67,798	2,745,928	2,222,648
Ont. & Western.....	216,963	60	859,199	656,927
Total.....	5,966,189	266,625	22,886,065	18,475,976

Stocks at Tidewater at the close of April were 546,243 tons as compared with 772,115 tons on Mar. 30.

FOREIGN MARKETS

GREAT BRITAIN

Apr. 25—The demand is quiet at present, but colliery-owners are well placed as regards orders and are not willing to reduce quotations for prompt or forward loading.

Quotations are approximately as follows:

Best Welsh steam.....	\$5.04@5.16	Best Monmouthshires..	\$4.56@4.68
Best seconds.....	4.86@4.98	Seconds.....	4.44@4.50
Seconds.....	4.68@4.80	Best Cardiff smalls.....	3.54@3.60
Best dry coals.....	4.74@4.92	Seconds.....	3.18@3.30

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

SPANISH IMPORTS

Spanish imports of coal for the first two months of the current year were 409,975 tons as compared 397,489 for the same period last year. Coke imports for the same periods were 59,537 tons and 78,193 tons respectively.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Apr. 26:

Stocks	Week's Range			Year's Range	
	High	Low	Last	High	Low
American Coal Products.....	87	87	87	87	87
American Coal Products Pref.....	109½	109½	109½	109½	109½
Colorado Fuel & Iron.....	32½	31	31½	41½	31
Colorado Fuel & Iron Pref.....			155	155	150
Consolidation Coal of Maryland.....	102½	102½	102½	102½	102½
Lehigh Valley Coal sales.....	225	210	215		
Island Creek Coal, com.....	52	51	51		
Island Creek Coal Pref.....	85	84	84		
Pittsburgh Coal.....	18	17½	18	24½	17½
Pittsburgh Coal Pref.....	80½	79½	80	95	79½
Pond Creek.....	22½	19½	19½	23½	19½
Reading.....	161½	157½	160½	168½	152½
Reading 1st Pref.....	91	90	90	92½	89½
Reading 2nd Pref.....	92	92	92	95	87½
Virginia Iron, Coal & Coke.....	47	45	45½	54	44½
Bonds	Closing Bid Asked		Week's Range or Last Sale		Yea.'s Range
Colo. F. & I. gen. s.f.g. 5s.....	95	98½	95	95	95 99½
Colo. F. & I. gen. 6s.....			107½	June '12	
Col. Ind. 1st & coll. 5s. gu.....	78½	79	78½	78½	78½ 85
Cons. Ind. Coal Me. 1st 5s.....	75	80	85	June '11	
Cons. Coal 1st and ref. 5s.....		94	93	Oct. '12	
Gr. Riv. Coal & C. 1st g 6s.....		100	102½	April '06	
K. & H. C. & C. 1st s f g 5s.....			98	Jan. '13	98 98
Pocah. Con. Coll. 1st s f 5s.....		87½	87½	Mar. '13	87½ 87½
St. L. Rky. Mt. & Pac. 1st 5s.....	77	78	76	Mar. '13	76 80
Tenn. Coal gen. 5s.....	100	101½	100	April '13	100 103
Birm. Div. 1st consol. 6s.....	101½	103½	101	April '13	101 103
Tenn. Div. 1st g 6s.....		103½	102	Feb. '13	102 102
Cah. C. M. Co. 1st g 6s.....		104	110	Jan. '09	
Utah Fuel 1st g 5s.....					
Victor Fuel 1st s f 5s.....	80	82½	79½	Feb. '13	79½ 76½
Va. I. Coal & Coke 1st g 5s.....	93	95	93	93	93 98

DIVIDENDS

Mahoning Coal R.R.—Common—Dividend of \$25 payable May 15 to holders of record May 1.

Lehigh Coal & Navigation (No. 138)—Regular quarterly of \$1 payable May 31 to holders of record Apr. 30.

Roby Coal Co. (Cleveland)—This company is offering at par and interest, \$200,000 consolidated first mortgage 6% bonds, the balance of an authorized issue of \$675,000, of which \$75,000 has been retired. Par value of bonds is \$1000, and they are secured by a sinking fund of 5c. per ton of coal.

PRICES OF MINING SUPPLIES

THE MARKET IN GENERAL

Sentiment did not improve during April as was expected, in fact, there was more pessimism on May 1 than there was on April 1. Numerous factors combine to cause this, not the least of which was the continuation of the unrest in the far East, due to a quarrel among the allies regarding the spoils of war, which further disturbed the peace of Europe and upset the balance of powers. Monetary conditions grew slightly easier toward May 1, but it is a noticeable fact that large corporations and even municipalities were unable to secure funds on as favorable terms as heretofore.

The course of prices has been toward lower levels in the market for iron and steel, and the demand for a number of products has not been as great as was expected, save in the regions lately devastated by flood and cyclone. Metals are higher in price, while cement is in excellent demand at unchanged quotations. The steel companies have made satisfactory returns for the first quarter of the year, although the earnings of the leading manufacturer were not up to expectations, and other industrial companies are making fair profits.

The tariff bill which was introduced in Congress, and is being discussed, is not as drastic as many believed it would be, and as yet it has not had the effect of unsettling business that even the most sanguine expected.

LABOR

Strikes have been of more frequent occurrence, and labor unrest is more pronounced this spring than it was a year ago in spite of the fact that there is less demand for labor than at that time. In addition to a bitter and prolonged strike among the silk mill operators in Paterson, there is a prospect that the machinists may endeavor to force the issue for an eight-hour day, and now that the wages of the firemen have been settled, other railway employees are making demands for higher wages. This time it is the trainmen.

The strike among the operators of the twine mill of the International Harvester Co. continued during the early days of April with much bitterness, and finally the company announced that if settlement were not made by a certain date, the mills would be dismantled and the machinery shipped abroad. The company even went so far as to have machinists take apart some of the machinery preparatory to shipment abroad. Such a proceeding does not help the employer in any endeavor to gain the good will of the employees.

There is a general demand for outside labor, but it is not as urgent as last year.

IRON AND STEEL PRODUCTS

Business during April did not develop as was expected, and the total business transacted was slightly less than during March. In the line of finished steel, there were no great reductions in price, in fact there were some advances, but there was a feeling of unrest which resulted in fewer orders being placed, and less activity at the mills. The particularly unsatisfactory part of it is that the price of pig iron continued to decline.

Steel billets are \$1 a ton cheaper than last month; wire products are slightly higher; there has been some uneasiness in the price of sheets with a result that quotations are \$2 per ton less at certain quarters. Bars are fairly active, and, especially those for reinforcing work, are in excellent demand. Rails have been in less requisition, although somewhat over 100,000 tons were purchased during April, and a good export order received. The price of pipe was advanced, but the great falling off was in the demand for railway cars and equipment. The railways are too beset by financial troubles, and the securing of funds is too uncertain to permit them to buy more equipment than is absolutely needed.

Steel Rails—The demand for light rails has not been as large as earlier in the year, but some very fair orders for contractors' equipment were received. Early in the month the railways purchased 65,000 tons, and during the last week, a single system ordered 35,000 tons, and there were a few scattered orders aggregating 20,000 tons more. Quotations continue unchanged at 1.25c. per lb. for standard sec-

tions, weighing from 50 to 100 lb per yd.; 1.21c. for 40- to 50-lb. rails; 1.30c. for 16- to 20-lb. rails. These quotations are for carload lots f.o.b. Pittsburgh. In Chicago, 16- to 20-lb. rails, are 1.30; 12-lb., 1.35c.; 8-lb., 1.40c. Relaying rails in Chicago are \$24 per gross ton and they can be had at other centers at approximately the same quotation.

Track Supplies—Due to the floods in Ohio, and the demand for an unusual number of track laborers in that section for work other than the relaying of rails, there has not been the active demand for track material that there was earlier in the season. By June, this should return, however, and at that time, business will be just as rushed as ever. Spikes are 2.10c. base for large lots; track bolts with square nuts, 2.40@2.50c. base, and tie plates \$34@36 per net ton. These quotations are for Chicago delivery. In Pittsburgh angle base are 1.50@1.60c. and spikes 1.95@2.15c. These quotations are per lb. in fairly large lots.

Pipe—On Apr. 12, there was a revision of discounts for pipe, amounting to an advance of approximately \$1 a ton, or a half point in the discount. Business during the month was exceptionally large, one of the leading fuel companies in Pittsburgh buying about 80 miles of pipe, and other companies inquiring for large quantities. The mills are able to make fairly prompt shipments, but the pipe business is very satisfactory. New discounts are as follows:

	Black Galvanized	
¾- to 2-in. butt welded.....	79½ %	70 %
2½- to 6-in. lap welded.....	78½ %	70 %

Based on these discounts, the net price of pipe per foot are as follows in carload lots f.o.b. Pittsburgh:

Size, inches	Black Galvanized	
	Black	Galvanized
¾	2.35	3.40
1	3.50	4.90
1¼	4.75	6.60
1½	5.55	8.00
2	12.60	17.50
3	16.50	23.10

Sheets—There was considerable weakness in the sheet market before the floods in Ohio put a number of mills out of commission, but that strengthened the market materially. Since that time, these mills have been able to resume operations, and in consequence the market has again weakened. The mill which was the leading factor in lower prices during March, has again gone out aggressively after orders, and is cutting prices from \$1 to \$2 per ton. There has been no change in price by the largest manufacturers, and it is stated that this weakness is only temporary, being due to peculiar causes, and the shortness of semi-finished steel will in itself prove a barrier to any lower prices. However, this is more a matter of conjecture than anything else.

The following prices are for lots of a few bundles f.o.b. Pittsburgh and Chicago. These should not be confused with the quotations for carload lots, which is 2.30c. f.o.b. Pittsburgh for No. 28 black.

	Cents per Pound			
	Pittsburgh		Chicago	
	Black	Galv.	Black	Galv.
Nos. 22 and 24.....	2.75	3.55	2.70	3.50
Nos. 25 and 26.....	2.80	3.70	2.75	3.65
No. 27.....	2.85	3.95	2.80	3.90
No. 28.....	2.90	4.00	2.85	2.95

Structural Materials—Replacement orders by the railroads have not been as large as was expected at the time of the flood, and the only really large order placed was by the Big Four for 6000 tons of bridge material.

Fabricating shops are not nearly as busy as they were, and shops in the Middle West, as well as those in the East, are able to make contracts for fairly prompt delivery. The plate market is easier, chiefly because of the falling off in the demand for car-building materials. Shipbuilding work continues fairly active.

Quotations are without change as far as future deliveries are concerned, but for prompt shipment there has been a reduction of \$1 to \$2 per ton. Plates, beams and angles are 1.50c., base Pittsburgh, for future shipment, and 1.60c. for prompt shipment. In Chicago, the quotation for future ship-

ments is 1.68@1.73c., and prompt deliveries are held at \$1 per ton higher. All of these prices are per 100 lb. in carload lots.

WIRE PRODUCTS

Wire—Business is fairly active as far as shipments are concerned, but few new orders are being booked on account of the advance in March. Previous to that time, most of the large consumers were fairly well informed that an advance would take place, and in consequence placed large orders, so there will be no orders for some time to come. For large lots, quotations are as follows: Painted barbed wire, \$1.86; galvanized, \$2.20; annealed fence wire, \$1.60; galvanized, \$2.05. In Chicago, annealed fence wire is \$1.78 and galvanized, \$2.18. Barbed-wire fencing in that market is \$1.98 and galvanized, \$2.38. All of these quotations are per 100 lb.; for smaller quantities bought from jobbers' stores, an advance of about 25c. per 100 lb. is named.

Wire Rope—The market is steady and prices are unchanged. Two-inch rope in Pittsburgh is held at 57c. per lin.ft.; 1½-in., 23c.; ¾-in., 10c. These quotations are for best grades or for special grades of wire rope, but cheaper grades can be obtained at considerable concessions.

Copper Wire—The market is steady, business is active and prices are higher. There has been an unusual demand for special grades of copper during the month and quotations are high at 17c.

Telegraph Wire—Business is fairly active with quotations unchanged as follows:

Prices are as follows in cents per pound for wire measured in the Birmingham wire gage: "Extra Best Best," Nos. 6 to 9, 4½c.; Nos. 10 and 11, 4½c.; No. 12, 4½c.; No. 14, 5½c.; "Best" Nos. 6 to 9, 3½c.; Nos. 10 and 11, 3½c.; No. 12, 3½c.; No. 14, 4c. Actual freight is allowed from Trenton, N. J., where it does not exceed 25c. per 100 lb.

HARDWARE

Bar Iron and Steel—Prices are steady. Stocks are well assorted, and consumers can secure supplies desired with little difficulty. Quotations from jobbers' store in New York and Chicago are as follows:

	Per lb.
Refined iron:	
1 to 1½ in., round and square.....	2.10c.
1½ to 4 in. x ½ to 1 in.....	2.10c.
1½ to 4 in. x ¼ in. to ⅝ in.....	2.30c.
Norway bars.....	3.60c.
Soft steel:	
¾ to 3 in., round and square.....	2.05c.
1 to 6 in. x ¾ to 1 in.....	2.05c.
1 to 6 in. x ½ and ⅝ in.....	2.20c.
Rods—¾ and 1 in.....	2.15c.
Bands—1½ to 6x⅝ in. to No. 8.....	2.35c.
Beams and channels—3 to 15 in.....	2.15c.

Nails—Building all over the country is not as active as last year and in consequence the demand for nails has slumped off to quite an extent. Prices, however, are steady, large lots being held at 1.80c. Pittsburgh, 2.08c. Chicago. For small lots from jobbers' stores the price is 2c. in Pittsburgh and 2.28c. in Chicago. Quotations approximating those of Chicago are made for most Central West jobbing points.

Rivets—The demand for rivets is not as active as last month, and there is less urgency for shipments. Quotations are \$2.20 for structural rivets and \$2.30 for boiler rivets. These prices are per keg of 100 lb.

Chain—Prices of chain are firm, but the buying has not been especially large. Ruling quotations per 100 lb., f.o.b. Pittsburgh, are as follows:

¾ in.	\$7.50
1 in.	4.95
1½ in.	3.95
2 in.	3.40
2½ in.	3.20
3 in.	3.00
3½ in.	2.90
4 in.	2.80
4½ in.	2.70
5 in.	2.60
1 to 1½ in.	2.60
Extras for BB	
¾ in.	1.50
1 in.	1.50
1½ in. and larger.....	1.25

Extras for triple B (BBB)	
¾ in.	2c.
1 in. and larger.....	1.75c.

METALS

Copper—The excellent buying in the copper market, which was noted a month ago, has continued practically throughout the month, domestic consumers having purchased large quantities at steadily advancing quotations. In addition to this, consumers of copper abroad have made large purchases, and exports during April were large, but did not

come up to the record-breaking figures of March. It is practically impossible to secure deliveries of special grades within 60 days. Electrolytic copper sells at 15½ to 16¼c. for large lots, and Lake, 16¼ to 16½c. from store New York.

Tin—The market is steady and higher, and tin is selling at around 50c. per pound in New York.

Lead—Prices are very firm, and the market is steady at 5.50c. New York and 5.35c. St. Louis.

Solder—Strictly half and half solder is selling in the New York market at 27½ to 28c.

MISCELLANEOUS

Castings, Gray Iron—The foundries making castings are not able to secure all the orders they desire, and have been going out after business. Rough castings in large quantities can be had at 1.75 to 2.25c. per lb.; smaller castings, such as are used for construction work, command from 2.50 to 3c. per lb.

Brattice Cloth—Conditions have not changed materially regarding brattice cloth. The demand is just as active as it was, in fact more so, and the supply continues short. Deliveries are being made with more freedom, especially by foreign manufacturers, but there are no large stocks on hand at any point. The tariff situation is not troubling dealers in brattice cloth any for the present, for the reason that there are no stocks on hand, and, according to the present schedule, it is difficult to see where there will be any material change in the price of this material.

Portland Cement—Manufacturers and dealers in cement are not as optimistic regarding the outlook as they were two months ago. There will be a large quantity of cement used in various places, but a great many of these contracts have been covered and, moreover, a good deal of this work will extend over a long period of time. Consequently, there is not the feeling at present that there will be an advance, as was so sanguinely stated about two months ago. Quotations are firm at \$1.58 in both New York and Pittsburgh. This allows 40c. for bags returned.

Rope—Manufacturers of rope have never had such a season as the past one. Prices have advanced, and the best grades of Manila rope are selling at 15 to 16c., while hardware grades, which formerly sold at 6c., are now commanding 12 to 13c.

Bars, Concrete Reinforcing—Orders for bars are large, but stocks are sufficient to meet the demand. Prices are firm and for small lots from warehouse stock are as follows:

PITTSBURGH PRICES IN CENTS PER POUND

	Warehouse Stock
¾-in.	2.00@2.10
1-in.	2.05@2.15
1½-in.	2.10@2.20
2-in.	2.25@2.35

Triangular Mesh—Makers of this material are able to make prompt shipments.

From mills in De Kalb, Ill., quotations are 18c. per 100 lb. higher than those quoted below, which are 100 sq.ft. f.o.b. Pittsburgh. These are for lots of less than 10,000 sq.ft.

No. 23	\$1.23	No. 32	\$2.62
No. 23	2.05	No. 36	1.05
No. 26	1.42	No. 40	3.25
No. 28	1.97	No. 41	2.48

Shafting—Specifications are coming in freely and although the automobile manufacturers seem to have contracted for all the material they will need this year, there is some very fair business. A slight revision has been made in the price of shafting, and new discounts are 58% from list in carload lots and 53% from list in less than carload lots. Business is fair. The following net prices per foot are based on the discount of 53%.

Diameter in inches	Cents per foot	Diameter in inches	Cents per foot
¾	4.25	2¼	31.50
1¼	10.80	2½	39.30
1½	14.05	2¾	48.00
1¾	19.20	3	56.50
2	25.00	3½	84.00

Packing—Prices vary within wide limit, according to the brands of various dealers, but in general, packing can be purchased at the following quotations: Asbestos, wick and rope, 13c. per lb.; sheet rubber, 11@13c.; pure gum rubber, 40@45c.; red sheet packing, 40@50c.; cotton packing, 16@25c.; jute, 5@6c.; Russian packing, 9@10c.

Plates—Manufacturers continue to catch up with orders and shipments are much more satisfactory. New business is coming in slowly, and there is a dearth of new orders, especially from car builders. Railroads are not buying cars in any quantity.